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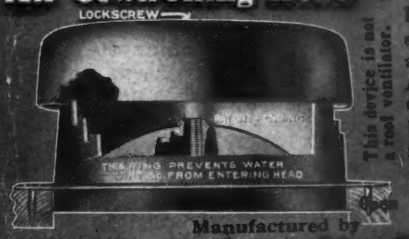

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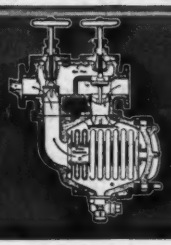

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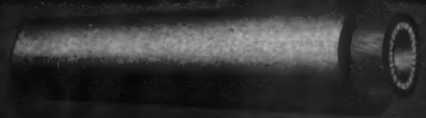

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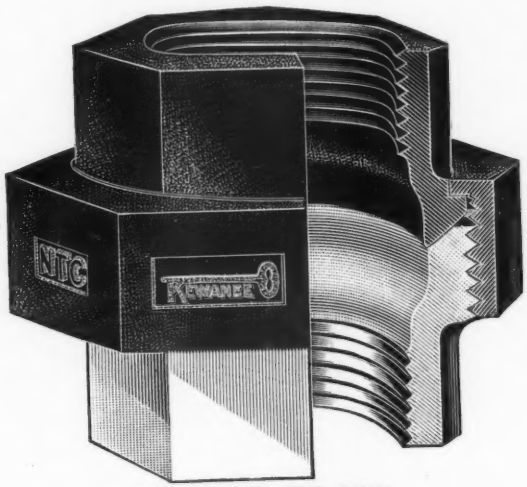
A Little History of the "KEWANEE" UNION



LOOK FOR THE KEY!
"The Air-Tested Union With No Inserted Parts"
The "Safety-First" Union

¶ No original mechanical device springs fully developed from the brain of the inventor. It is a long way from the kite string of Franklin to the wireless of Marconi; from the first crude pipe coupling to the "KEWANEE" UNION. The history of development is always worth while, and something about the early history and evolution of the "KEWANEE" UNION will probably be of general interest.

¶ A number of years ago there was a factory at Kewanee, Ill., where steam-heating boilers, radiators, etc., were made. In order to sell these boilers it was necessary to take contracts to heat buildings with steam and then install the apparatus.

¶ Naturally a number of steam fitters were employed, and when going over the plans, in many cases, the master steamfitter would recommend a malleable union at various points.

¶ The President of the Company, however, would never allow a malleable union to be used; he would say: "A malleable union is a misnomer; after it has been up a while it is of no use; it is then only a coupling, because the threads rust together at the nut and it cannot be disconnected except by spoiling the fitting. If you must use a union, use a flange union."

¶ Now a flange union is an unsightly fitting in a residence and many were the discussions between the steamfitters (who naturally desired a neat, workmanlike job) on the one hand and the President of the Company on the other. This President's successor, who had been a witness to the frequent arguments regarding the union question, conceived the idea one day that if a union could be made which could be disconnected and reconnected an indefinite number of times he would have a fitting which would meet a long-felt want.

¶ The President went over the matter with steamfitters and other practical men without much result, but finally it occurred to him to make a union with a **brass to iron thread connection.**

¶ The result at first was crude, but patterns were made and changed, and today the finished product (the result of this idea) is seen in the "KEWANEE" UNION.

¶ An iron to iron thread connection will ultimately rust together. A brass to iron thread connection will **not** rust together, and can be disconnected and reconnected almost indefinitely.

¶ The "KEWANEE" UNION has other points of advantage, but it remains today absolutely unique in these respects—brass to iron thread connection, no inserted parts, and compressed air test under water of each separate union.

Our new booklet, THE WHOLE "KEWANEE" FAMILY, tells all about "KEWANEE" Unions. Get a copy to keep on file. It will tell you how to eliminate wastes from leaky unions. A post card brings it!

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK MARCH, 1916

Pipe Hangers

METHODS OF ARRANGING AND DETERMINING STRENGTH OF VARIOUS TYPES OF SUPPORTS

BY HAROLD L. ALT.

I.

The science of pipe hanging is often neglected on smaller-sized jobs, but in larger work must be carefully considered. This is especially true where the pipes are either large or numerous and must be supported in a neat, substantial manner with allowance for individual adjustment, expansion, etc.

How to accomplish this in the cheapest satisfactory manner for certain cases is illustrated in this article and the reader may rest assured that while it may be possible to support a pipe in a cheaper manner, it will not be as satisfactory as the hangers and supports shown, which are standard as adopted by the foremost engineering and power organizations in this country.

FIGURING STRENGTH OF U BOLTS.

The support of horizontal pipe generally develops into a U-bolt type of hanger. Examples and methods of figuring strength for same are shown in the following:

In Fig. 1 is shown a hanger carrying three pipes which may all be assumed as full of water. If hangers are, say, 10 ft. apart, each U-bolt carries 10 lineal feet of pipe or a load of ten times 16 lbs. or 160 lbs. for 4-in. pipe; 10 times 23 lbs. or 230 lbs. for 5-in. pipe; ten times 31 lbs. or 310 lbs. for 6-in. pipe.

If U-bolts are figured at lower stress per square inch on account of part of metal being cut away in threading the ends, 8,000 lbs. is a good safe figure to use. Even at this low mark a ½-in. bolt will carry ½ x ½ x 0.7854 x 8,000, or roughly 1,500 lbs. and when bent in U-shape it will carry twice as much or 3,000 lbs. load. This shows that a ½-in. U-bolt would carry ten times as much 6-in. pipe as we have in the case under

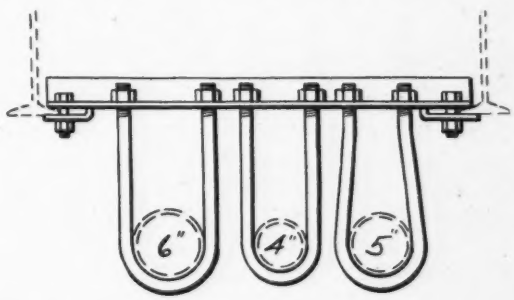


FIG. 1.—U-BOLT TYPES OF HANGERS.

consideration, thirteen times as much 5-inch pipe and nineteen times as much 4-in. pipe.

These pipes being spread along the whole length of the angle practically constitute a distributed load so that the bending moment is WL divided by 8, when W is the total weight of the pipes and L the length in inches of the angle, or, say, 5 ft. Then WL is (160 + 230 + 310) x 60 = 700 x 60, or 42,000 in lbs. 42,000

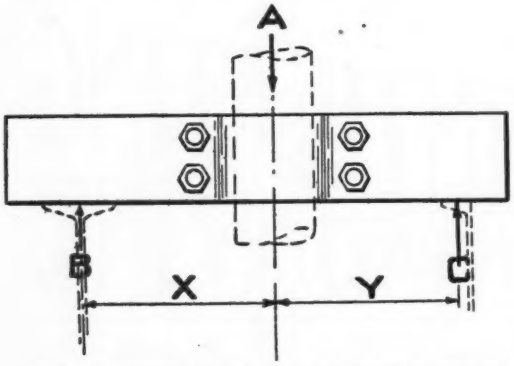


FIG. 2.—SUPPORT FOR VERTICAL PIPE.

divided by 12,000 lbs. stress equals 3.5 sectional modulus.

As can be found in any steel catalog 4-in.—5.25 lb. channel has a sectional modulus of 1.9 and, therefore, two of these will give a combined modulus of 3.8. This shows that the angle given in the figure should not be used since channels are always more economical in material for the same strength and the two 4-in. channels in this case should be substituted.

DETERMINING REQUIRED STRENGTH OF HANGERS FOR VERTICAL PIPES.

Let us see how to determine the required strength of a few types of hangers for use on vertical pipes. In Fig. 2 is shown a support for a vertical pipe which rests on two steel members. When the weight of pipe is 2,000 lbs. pressing down at A, the load on beams at B and C will be approximately ½ of 2,000 lbs. or 1,000 lbs. each. Then the bending moment is that for a simple beam with a concentrated load, or WL divided by 4. W is weight of pipe and L, length of span in inches (X plus Y) which we will assume as about 3 ft. in this case. Then the bending moment equals 2,000 × 36 divided by 4, or 18,000 in. lbs. If the working stress in metal is kept down to, say, 12,000 lbs. per square inch, the sectional modulus required will be 18,000 divided by 12,000 or 1.5.

Now that we know the sectional modulus required, it only remains to find the shape which has an equal or greater sectional modulus. The construction of this hanger requires the use of flat iron in two pieces and in order to get in two bolts side by side the height must be 5 in. or 6 in. This leaves us to determine the thickness only. Now this piece of flat iron, having its two dimensions different, is rectangle in cross section, the height of the rectangle being, say, 5 in. and its width (or thickness of metal) yet to be determined. The sectional modulus of any rectangle is obtained by multiplying the breadth by the square of the height and dividing by 6. Knowing the heigth (5 in.) already we have breadth x 5 x 5 divided by 6 = sectional modulus, or

Breadth x 5 x 5 divided by 6 = 1.5.
Breadth x 25 divided by 6 = 1.5.
25 x breadth = 1.5 x 6.
25 x breadth = 9.
Breadth = 0.36 in. or 3/8-in.

This total breadth is for two pieces, each piece being only half as thick, or 3/16-in. In actual practice, however, these would probably be made 3/8-in. thick each and certainly not less than ¼-in.

CANTILEVER BEAM HANGERS.

In Fig. 3 is shown a clamp that is supported on one side only, forming what is known as a cantilever beam. The bending moment is obtained here from the cantilever beam formula which is WL, when W is load of pipe and L distance X from the center line of pipe to the center line of beam or support. Actually it is quite likely that distance L should only extend from the center line of the pipe as far as F, instead of way over

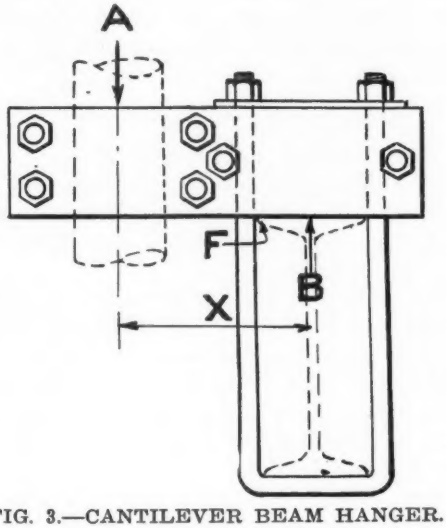


FIG. 3.—CANTILEVER BEAM HANGER.

to the center line of beam, but this error, if present, is on the side of safety and need not be seriously considered. If the pipe load in this case is 3,000 lbs. and the distance X, say, 24 in., then WL equals 3,000 x 24 in., or 72,000-in lbs. and 72,000 divided by 12,000 = 6 required sectional modulus. Then, by methods similar to those already employed, we assume that our rectangular (high). Then our rectangle sectional modulus is

$$\frac{\text{Breadth} \times 6 \times 6}{6} = \text{regular sectional modulus of 6.}$$

Breadth x 6 = 6.

Breadth = 1.

or each flat is ½-in. thick which is much better.

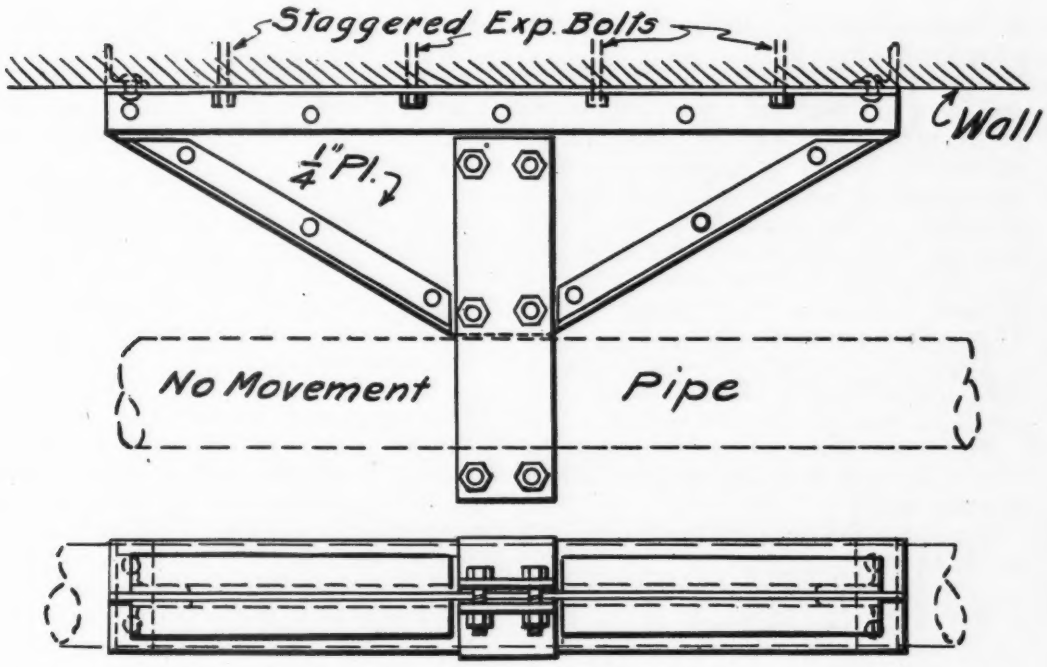


FIG. 4.—PIPE ANCHOR FOR USE NEAR MASONRY WALLS.

piece of flat is 5-in. high and solve as follows:

$$\frac{\text{Breadth} \times 5 \times 5}{6} = 6$$

$$\text{Breadth} = \frac{6}{25} \times 6$$

$$\text{Breadth} = \frac{36}{25} \text{ or } 1.44 \text{ in. width required.}$$

Half of this thickness in each piece of clamp would give ¾-in. metal, which is pretty heavy to bend, so we might try the figuring over again, using a flat 6-in. wide

To find size of U-bolt we have to note that the tendency of the hanger when carrying its pipe is to turn around point F. The U-bolt prevents this, but only with the rear leg; the other leg at F is neutral as far as this turning motion is concerned. Again, in figuring U-bolts we consider the centre line of beam rather than point F and again the error (if any) is on the side of safety. The load exerted on the rear leg of the U-bolt is found by multiplying the pipe load by its distance from the turning centre B and dividing by distance from turning center B to leg of bolt. If the pipe is 24 ins. from beam and the U-bolt leg only 4 ins., then the force exerted on the rear leg of

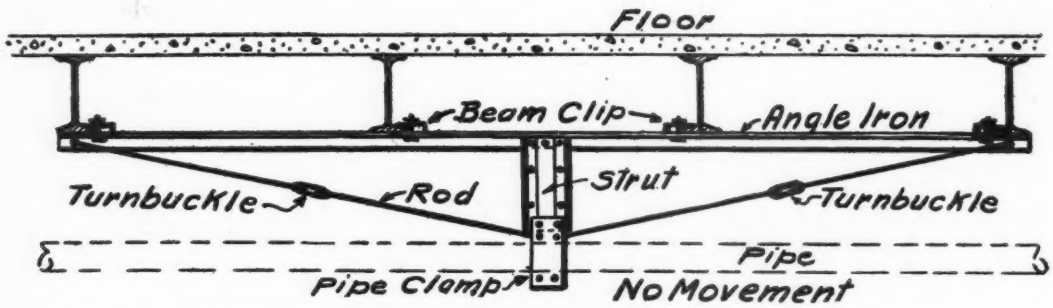


FIG. 5.—PIPE ANCHOR FOR USE UNDER FLOOR BEAMS.

U is pipe load multiplied by 24 and divided by 4 which is

3,000 x 24 divided by 4 = 18,000 lbs.

Allowing 8,000 lbs. per square inch stress in leg of bolt we have an area required of 18,000 divided by 8,000, or 2.25 sq. ins., which is the area of a bolt 1¾ in. diameter. This size bolt is out of the question so that we must either move our pipe in to, say, 12 ins. or use a different method of support. If we move it in to 12 ins. from center line of beam we have

3,000 x 12 divided by 4 = 9,000 lbs.

9,000 divided by 8,000 = 1.12 sq. in. area, or 1¼ in. bolt, which is not so bad.

This also allows us to cut down the size of the flat iron employed in the clamp as follows:

Breadth x 5 x 5 = 3,000 x 12 divided by 12,000.

$$\frac{25 \times \text{breadth}}{6} = 3.$$

$$25 \times \text{breadth} = 18$$

$$\text{breadth} = \frac{18}{25} \text{ equals } 0.72 \text{ in. total}$$

thickness or ⅜-in. for each piece.

FIGURING PIPE ANCHORS.

When it is desired to anchor pipe figuring is not so easy, owing to fact that no one seems yet to have devised a method whereby the stress thrown onto the anchor can be determined. If the force that pipe will exert is known, it is comparatively easy to figure sizes on the anchor itself.

Owing to this uncertainty anchors are usually designed even more conservatively than pipe hangers and for all pipes of large size are generally made heavy enough so that the pipe can't get away without taking the building (or whatever the anchor is fastened to) along with it. Fig. 4 shows a good solid type of anchor often employed where pipes run near masonry walls. When properly put up it gives good satisfaction. The reason for putting angle clips on the back is to get a good bearing on wall without depending on the bolts to prevent sliding. Oftentimes without these clips the force tending to move the anchor is sufficient to crush the brick or mortar immediately behind the bolts, thus dangerously loosening the anchor.

One good type of anchor for cases where pipes run under floor beams is shown in Fig. 5. Movement in either direction is resisted by two beams and the placing of *two* beam clips on each beam would result in all four beams getting the load. A strut in the middle prevents the pipe being raised when turnbuckles are

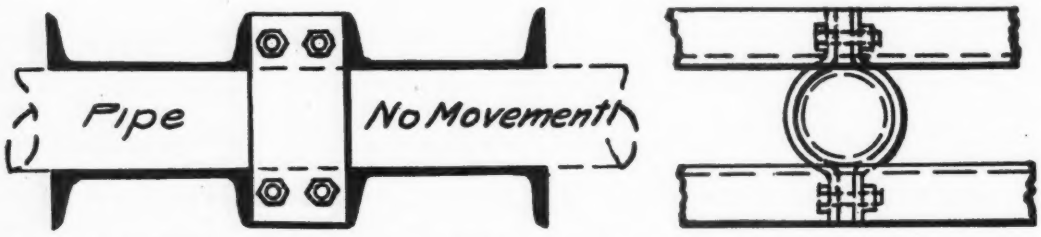


FIG. 6.—ANCHOR DESIGNED ESPECIALLY FOR USE IN PIPE TUNNELS AND TRENCHES.

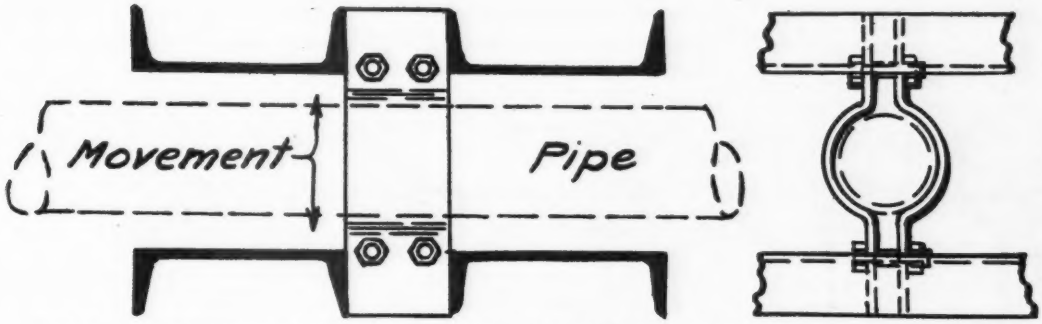


FIG. 7.—ARRANGEMENT OF ANCHOR TO PREVENT BACKWARD OR FORWARD MOVEMENT OF PIPE.

tightened, and turnbuckles and rods give this anchor great tautness and rigidity without any twisting tendency.

In Fig. 6 is shown a type of anchor often used in pipe tunnels and trenches where cross channels can be set in masonry on each side of the pipe. If, by any possibility, a lateral movement of pipe has to be taken care of, provision is made for so doing by an arrangement such as is shown in Fig. 7, where the pipe is free to move up or down, but neither backward nor forward.

A typical example of the concrete application of the foregoing abstract rules and calculations will be found in Fig. 8. Here we have a pipe coming in near the basement floor, rising up to the first floor ceiling and running along the ceiling beams. Owing to the pipe being anchored farther back we have some expansion to take care of at point No. 4 and also expansion in two different directions (as shown by the arrows) at point No. 3. Risers can be hung in three ways:—at bottom, at top, and at points between, if

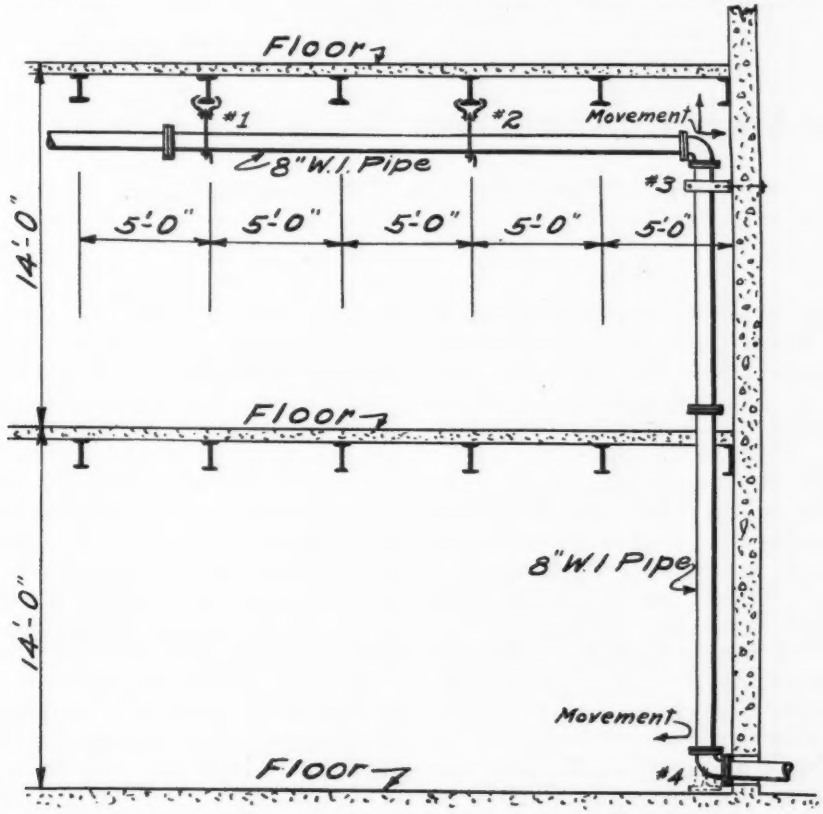


FIG. 8.—TYPICAL ARRANGEMENT OF PIPE HANGERS AND BASE ELL.

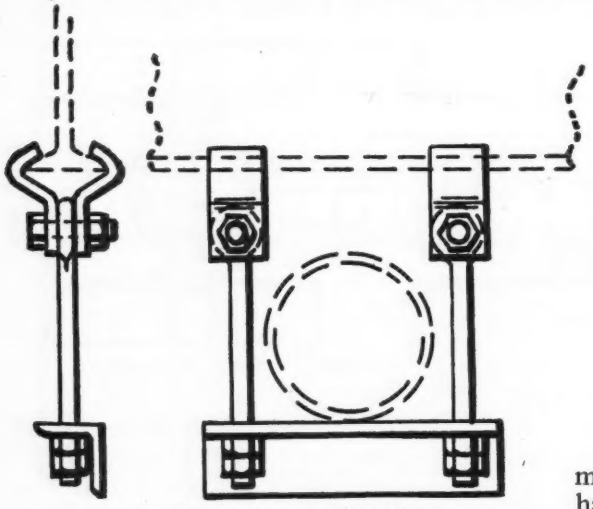


FIG. 9.—DETAIL OF HANGERS NOS. 1, 2, 5 AND 6.

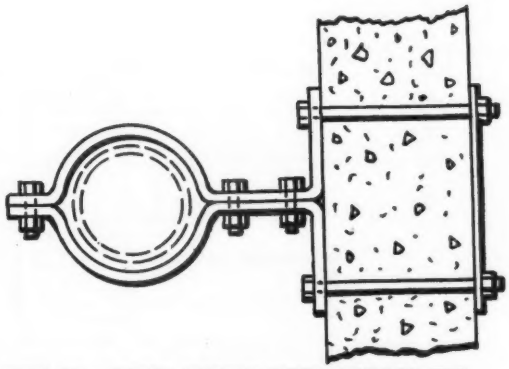


FIG. 10.—PIPE GUIDE PERMITTING EXPANSION AND CONTRACTION.

expansion joints or loops are provided. As there is no provision for expansion here, suppose we try supporting the riser at the bottom. The easiest way to do this would be to insert a base ell at point No. 4 (as shown in dotted lines) and to put rollers under foot to allow for expansion movement. Then at point No. 3 we should have to leave pipe free to move up and down on account of the expansion in the riser between base ell (which is a fixed point) and point No. 3. A guide consisting of simple clamp made about ½-in. larger than the pipe, as shown in Fig. 10, will answer every purpose at this point, and at points Nos. 1 and 2 hanger, as shown in detail in Fig. 9, can well be used.

(*To be Continued.*)

New Empirical Formulae for Hot Water Heating

WITH PIPE SIZES FOR TWO-PIPE SYSTEMS:

By JAY H. KELLER.

The subject of hot water heating is the least known scientifically, among the general trade, of any of the branches of heating, and is the most difficult system to make operate successfully. Most of the contractors and some engineers have a hit-or-miss system for sizing the pipes which general experience through years of practice has finally boiled down to fairly successful operation, although the reason for the use of certain size mains, branches, valves, etc., is never clearly known. The only knowledge possessed is that the system works better under certain conditions and if certain size piping is used.

There is no hit-or-miss rule for governing the laws of Nature. They can be placed on a definite scientific basis of figuring, and the sizing of pipes for hot water heating is purely the result of a knowledge of the laws of gravity.

If all the mains, branches, valves, etc., in a system of gravity hot water heating were sized in proportion to each other, in accordance with the amount of radiation they handled, the sizes not being ridiculously small, and the supply and return mains so reversed that the length of pipe to each heating unit was the same, good results could be gotten without much figuring.

For the benefit of the trade and the profession, I would like to offer the accompanying tables and the following explanation of how they were derived. The coefficients used were mostly derived by the author through years of experiments

and tests, but the details of these tests will not be gone into except in a general way.

First to find the amount of water to be supplied to each foot of radiation per hour:

C = cubic feet of water per hour per square foot of radiation.

K = coefficient of transmission of cast-iron radiating surface.

T = mean temperature of water through radiators.

t = temperature of room.

t′ = drop in temperature of water through radiator.

W = weight of one cubic foot of water at mean temperature through radiator.

$$C = \frac{K\,(T-t)}{t'\,W}$$

The loss of heat from the water during its transmission from the boiler to the radiator and from the radiator back to the boiler was found by the following method:

T′ = temperature of water leaving boiler.

T″ = Final temperature of water at radiator inlet.

T″–t′ = temperature of water leaving radiator.

T‴ = final temperature of water entering boiler.

K = coefficient of transmission for pipe covering.

L = length of pipe in feet.

R = outside diameter of pipe in inches, divided by 2.

T⁗ = temperature of air around pipe covering.

$$T'' = \frac{12\,(T' - T'''')\,K'\,L\,t'}{\pi\,R^2\,K\,(T-t)}$$

$$T''' = \frac{12\,[(T'' - t') - T'''']\,K'\,L\,t'}{\pi\,R^2\,K\,(T-t)}$$

$$= \frac{12\,K'\,L\,t'\left\{\left[\left(\frac{12\,(T'-T'''')\,K'\,L\,t'}{\pi\,R^2\,K\,(T-t)}\right) - t'\right] - T''''\right\}}{\pi\,R^2\,K\,(T-t)}$$

The force causing the flow of water to the heating unit is the natural force of gravity, the radiator cooling the water which causes a difference in weight. The cooler water, being the heavier, falls, and the warmer water rises. The head causing this motion of the water is the head equal to the difference in weight between the two columns of water. Thus:

h = height in feet above the return opening in boiler.

W′ = weight of one cubic foot of water at $\frac{T'+T''}{2}$ temperature.

W″ = weight of one cubic foot of water at $\frac{[(T''-t)+T''']}{2}$ temperature.

H = total head.

H″ = velocity head.

H′ = friction head.

g = force of gravity (32.16).

d = diameter of the pipe in inches.

V = velocity of feet per second.

Using the formula by William Cox: which is close enough for all practical purposes and does not necessitate the use of complicated mathematical formulæ, we have the following:

$$V = \sqrt{2\,g\,H''}$$

$$H'' = 2\,V^2\,g$$

$$H = H' + H''$$

$$H' = \frac{L}{d}\,\frac{4\,V^2 + 5\,V - 2}{1200}$$

$$H = \frac{L}{d}\,\frac{4\,V^2 + 5\,V - 2}{1200} + 2\,V^2\,g$$

$$4\,V^2\,L + 5\,V\,L + 2400\,V^2\,g = 1200\,d\,H - 2\,L$$

$$H = \frac{h\,(W' - W'')^2}{288}$$

As all the other quantities are known, solve for V.

After finding the velocity, to find the amount of radiation that an assumed pipe will carry, I used the following:

S = amount of radiation in square feet.

$$S = \frac{36\ V}{6.545\ d\ C}$$

As the amount of radiation varies greatly between standard sizes of pipes, some arrangement must be made so as to only allow the correct amount of water to each radiator and to prevent short-circuiting. This is best obtained by installing copper discs, with holes bored in the center, in the unions of either the valve or the ell on the radiator.

To find the desired size of the orifice through the disc I used the following:

d′ = diameter in inches of the orifice through disc.

$$d' = 12\sqrt{\frac{C}{2572.92\ V}}$$

To find the size of the orifice through the disc without working back through the long series of equations, use the table and the following equation:

S = the desired amount of radiation.

S′ = the maximum amount of radiation that the pipe used will carry.

d = diameter of the pipe in inches.

d′ = diameter of the orifice in inches.

$$d' = 1.1\sqrt{\frac{Sd^2}{S'}}$$

For instance, we have 60 sq. ft. of radiation on the second floor, 100 ft. run of pipe, what size orifice in the disc?

The nearest size pipe in the table would be 1-in. and would carry 84 sq. ft. of radiation.

Then S. = 60
S′. = 84
d. = 1

$$d' = 1.1\sqrt{\frac{60 + 1^2}{80}}$$

= 0.942 in.

The constants used for the accompanying tables were as follows:

K = 1.62 B.T.U. (for two column 38-in. cast-iron radiation set against a cold brick wall near a window, average conditions.)
(one coat of bronze paint.)

K = 0.87 B.T.U. (3-ply asbestos air-cell covering and 5 oz. canvas jacket, no paint.)

The coefficient of discharge through the orifice in the equalizing discs was obtained by experiments and found to be 0.91. The metal used in the disc was annealed copper, 22 gauge.

RADIATION TABLE FOR TWO-PIPE GRAVITY CIRCULATION HOT WATER HEATING.

Boiler temp., 180° F. Temperature drop, 20° F. Piping figured as being covered with 3-ply air cell, 38-in. 2-col. radiators.

Diameter of Pipe, Inches.	Distance from Top of Boiler to Floor. 4 Ft. Above Boiler. Length of Run, Feet.					14 Ft. Above Boiler. Length of Run, Feet.				
	25	50	100	150	200	25	50	100	150	200
¾	60	40	28	24	18	103	60	40	34	27
1	84	56	38	32	26	210	130	84	70	56
1¼	206	136	97	81	64	375	245	162	135	108
1½	320	219	148	128	106	550	380	250	208	166
2	650	430	290	244	192	1,060	730	485	404	322
2½	1,080	620	420	352	280	1,730	1,200	820	683	546
3	1,900	1,300	908	754	598	3,000	2,000	1,300	1,080	860
3½	2,730	1,850	1,252	1,045	830	4,350	2,965	2,010	1,680	1,340
4	3,840	2,650	1,760	1,466	1,170	6,150	4,080	2,780	2,315	1,850
4½	5,150	3,480	2,320	1,936	1,550	8,170	5,560	3,700	3,080	2,460
5	6,850	4,640	3,160	2,630	2,100	11,100	7,350	5,000	4,165	3,330
6	11,200	7,400	5,000	4,170	3,330	17,350	11,700	7,800	6,500	5,200

RADIATION TABLE FOR TWO-PIPE GRAVITY CIRCULATION HOT WATER HEATING.

Boiler temp., 180° F. Temperature drop, 20° F. Piping figured as being covered with 3-ply air cell. 38-in., 2-col. radiators.

Diameter of Pipe, Inches	Distance from Top of Boiler to Floor. 24 Ft. Above Boiler. Length of Run, Feet.				34 Ft. Above Boiler. Length of Run, Feet.			
	50	100	150	200	50	100	150	200
¾	72	48	40	32	98	60	50	40
1	160	108	90	72	198	132	110	88
1¼	300	202	168	134	369	246	203	160
1½	480	320	262	213	570	380	315	250
2	940	640	530	426	1,020	750	625	500
2½	1,510	1,030	840	650	1,800	1,210	1,005	800
3	2,570	1,750	1,455	1,160	3,090	2,060	1,720	1,380
3½	3.820	2,560	2,130	1,700	4,590	3,060	2,530	2,000
4	5,280	3,560	2,960	2,360	6,360	4,240	3,520	2,800
4½	7,260	4,780	3,960	3,180	8,500	5,700	4,750	3,800
5	9,500	6,380	5,315	4,250	11,240	7,520	6,260	5,000
6	15,100	10,000	8,300	6,600	19,200	12,800	10,500	8,200

House Heating By Gas

WITH YEARLY OPERATING COSTS IN FORTY-SEVEN BUILDINGS USING NATURAL GAS

BY F. R. HUTCHINSON.

(Presented at a recent meeting of the Cleveland Engineering Society.)

Wouldn't it be nice to say to the skeptic: "We'll guarantee to heat your house next winter for the entire heating season on a consumption of less than 10 cu. ft. of natural gas for each cubic foot of space in your home? Tell us the width of your house. You say it is 28 x 30 x 20 ft. That totals 16,800 cu. ft. and will equal a gas consumption of 168,000 cu. ft. for the season, which, if figured at 30 cents per 1000 cu. ft. for the season, will cost you $50.40."

There are thousands of householders who would jump at the offer if made. Many of them are hard, or next to impossible, to convince by facts and figures gathered from their neighbors' homes who use gas, because of some unsatisfactory experience had, through careless operation or improper installation (usually the former) by a friend or relative.

It would be foolish for any gas company to make an offer of this kind, for no care would be exercised in the operation of the valves. That it can be done, however, is shown in the general summary (Table 8) following, which records actual gas consumption, where gas was metered separately to some 47 houses or apartments in Cleveland during the winter of 1914-1915, from the opening of the heating to April 14 or 15 of 1915. This consumption represents the average amount of gas used through six different makes of gas-designed steam, vapor, hot water and warm air boilers and furnaces and many kinds of coal-designed steam, vapor, hot water and warm air boilers and furnaces with gas burners installed.

Previous to the opening of the heating season, in the Fall of 1914, we secured permission to and installed 53 submeters in as many homes and buildings to separately measure the gas supplied to an equal number of gas-heating boilers and furnaces. We had been groping around in the dark regarding the actual average gas consumption of various kinds of gas househeating appliances.

VARIOUS TYPES OF INSTALLATION TESTED.

Without regard to previous consumption, for many of these installations are new, we prepared a list of some of each kind of house-heating installations to secure these records from and set these

sub or secondary meters to measure the gas consumed through the following kinds of installations, varying the size of homes and buildings heated as much as possible in scattered sections of the city to secure as nearly a true average as possible:

11—Gas Designed Steam Boilers.
2—Gas Designed Vapor Boilers.
5—Coal Designed Steam Boilers (with gas burners).
4—Coal Designed Vapor Boilers (with gas burners).
16—Gas Designed Water Boilers.
3.—Gas Designed Tank Water Heaters.
4—Coal Designed Water Boilers (with gas burners).
4—Gas Designed Warm Air Furnaces.
4—Coal Designed Warm Air Furnaces (with gas burners).

—
53

We have no knowledge of the manner in which these appliances were operated. Care may or may not have been exercised. The figures gathered are correct and reported exactly as found.

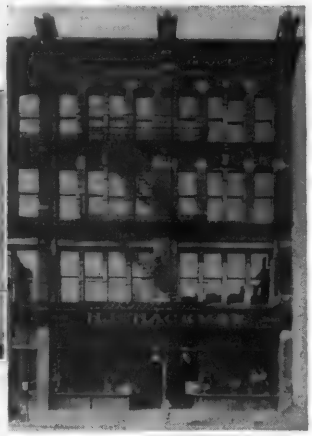
No. 1. Large building on corner and three houses on side street. Exposure moderate. Buildings of brick.

No. 10. Brick and frame building, 28 x 30 x 20 ft. Eight rooms. Moderate exposure. 70° F. maintained.

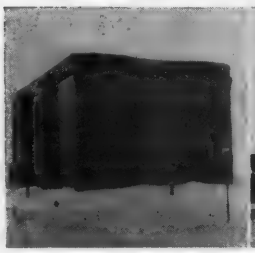
No. 2. Cement house, eight rooms and bath. Moderate exposnre.

No. 3. Frame house, eleven rooms and two baths. Boiler equipped with heat regulators set for 70° F. during day and 60° F. during night.

No. 6. Brick building, 56 x 43 x 40 ft. Two boilers. Three sides exposed.



No. 4. Four-story brick building, 85 x 40 ft. Moderate exposure.



No. 7. Four-family frame house, 73 x 48 x 20 ft. Each suite has five rooms, bath and hall. 70° F. maintained day and night. Owner provides heat for tenants.

No. 5. Four-family brick apartment, 36 x 60 x 20 ft., two stories. Four boilers. Each apartment contains six rooms. Exposure moderate. Apartment No. 3 maintains 80° F., the others 70° F.

No. 8. Frame house, 36 x 50 x 18 ft. Seven rooms and bath. 74° F. maintained. Exposure moderate.

No. 9. Frame house, 30 x 30 x 18 ft. Extreme exposure. 70° F. maintained.

These averages may not represent the general average of all house heating because of the comparatively few installations reported on.

Most of the figures seem consistent, however, except possibly in the totals for gas designed vapor heating where information was gathered from but two homes and seems very high as compared with gas designed steam heating, per hundred cubic feet of contents. Nothing has been omitted and records are reported as found in order to show the good with the bad, even though they may look inconsistent.

CUBICAL CONTENTS AS A BASIS FOR DETERMINING HEATING COSTS.

In my opinion there is but one way to determine cost for heating and that is upon the cubical contents of space to be heated. Radiation doesn't mean anything, for a home or building may be over or under radiated. Various forms of figuring radiation are employed and desires of owners to be considered. An owner constructing buildings or homes for investment seldom installs more radiation than actually necessary. A man erecting a home for comfort may play safe and furnish half as many more radiators as needed.

This may explain in part the wide difference between the minimum and maximum consumption in each classification in tables. Exposure and glass surface also play an important part, both in consumption per square foot of radiation and per cubic foot of contents.

Tables 1 to 8, inclusive, report details and summaries of all sub-meters. For the purpose of more nearly ascertaining a true average for house heating, several of the large buildings included in the totals of Table 8 were omitted in Table 9. *All the figures used in tables shown are based on natural gas sold at 30 cents per 1,000 cu. ft.*

The United States Weather Bureau reports average temperatures from November 1, 1914, to April 15, 1915, as follows:

	Deg. F.
November	41.9
December	27.0
January	26.0
February	32.8
March	30.4
April (to April 15)	42.0

We have assumed that April 15 closes the heating season. Some gas may have been used after that date for heating, but no great quantity, and it is pretty safe to assume these figures to be correct for an average season in our climate (Cleveland, O.)

ANALYSIS OF FIGURES.

A wide difference is represented between the minimum consumption 327 cu. ft., and the maximum consumption, 1,160 cu. ft. of gas per 100 cu. ft. of

TABLE 1.—STEAM AND VAPOR GAS HEATING.—GAS-DESIGNED BOILERS.

No. of Building.	Contents, Cu. Ft.	Sq. Ft. of Radiation.	Cost per Season.	Season's Cost per Sq. Ft. of Radiation.	Season's Consumption per Sq. Ft. of Radiation, Cu. Ft.
Steam.					
1	345,384	5,200	$510.51	$0.0981	327
2	15,336	634	81.57	0.1287	429
3	25,900	757	98.82	0.1305	435
4	940,000	1,726	294.90	0.1710	570
5	43,200	640	112.95	0.1766	588
6	96,320	2,189	494.76	0.2259	753
7	64,872	487	159.15	0.3267	1,089
8	32,400	244	84.90	0.3480	1,160
	1,563,412	11,877	$1,837.56	$0.1547	516
Average cost per 100 cu. ft. contents					$0.1175
Average consumption per 100 cu. ft. contents, cubic feet					392
Vapor.					
9	16,200	456	$66.96	$0.1467	490
10	16,800	345	68.13	0.1974	658
	33,000	801	$135.09	$0.1687	562
Average cost per 100 cu. ft. contents					$0.4094
Average consumption per 100 cu. ft. contents, cubic feet					1,365

contents in Table 1, Building Nos. 1 and 8, for steam heat supplied through gas-designed steam boilers. Vapor heating seems more consistent in the two cases reported, one showing 490 and the other 658 cu. ft.

Burners in coal-designed steam boilers in Table 2, Building Nos. 11 and 15, show 522 and 1,002 cu. ft., respectively. Burners in coal-designed vapor boilers, in the same table, report 490 and 951 cu. ft., respectively, for Building Nos. 16 and 19.

The summary in Table 3 is inconsistent because, as explained before, of large buildings being included. Eliminating these large buildings, steam and vapor heating of all classes summarizes about as follows, as shown in detail, without sub-totals, in Table 9.

No. 11. House 40 x 32 x 18 ft., extremely exposed. 70° F. maintained. 493 sq. ft. direct and 60 sq. ft. indirect radiation.

No. 12. Brick and shingle house, 43 x 69 x 20 ft., extreme exposure. 714 sq. ft. direct and 108 sq. ft. indirect radiation. 70° F. maintained.

No. 13. Frame house, 40 x 40 x 12 ft., twelve rooms. Extreme exposure. Inside temperature, 70° F. Heat regulator installed.

No. 14. Frame house, 26 x 37 x 18 ft., with 12 rooms and two baths. Exposure moderate. Temperature maintained at 72° F. Owner used bituminous coal previous winter at cost of $71. Burners installed in coal-designed steam boiler.

Fig. 15. Four-story brick building, 150 x 66 x 47 ft., two sides exposed.

Fig. 16. Ten-room frame house, 45 x 45 x 18 ft. Rather extreme exposure. 70° F. maintained. Owner used bituminous coal previous winter at cost of $80, paying $5.40 per ton.

Fig. 17. Twelve-room house, 70 x 50 x 16 ft. Exposure moderate. 72° F. maintained.

Fig. 18. Frame house, 30 x 42 x 18 ft., with eight rooms. 70° F. maintained.

Fig. 19. Eight-room frame house, 36 x 36 x 18 ft. 72° F. maintained.

Contents, Cu. Ft.	Season's Cost.	Season's Cost, 100 Cu. Ft. Contents.	Season's Consump., 100 Cu. Ft. Contents.
116,836	$ 378.24	$0.3240	1,080
33,000	135.09	0.4094	1,365
131,096	493.29	0.3747	1,249
145,458	437.31	0.3007	1,002
426,990	$1,443.93	$0.3381	1,127

A somewhat surprising thing noted here is the low operating cost for heating homes with hot water through ordinary independent or tank water heaters. Installations of this kind are very cheap and there is a big field in house heating for this method.

Building No. 37 in Table 5 is eliminated in the grand total in Table 9. In fairness to average-sized houses it has also been eliminated in the following table which should be construed as more nearly representing a truer average than Table 5.

Contents, Cu. Ft.	Season's Cost.	Season's Cost per 100 Cu. Ft. Contents.	Season's Consump., 100 Cu. Ft. Contents.
439,251	$ 992.67	$0.2260	753
94,214	228.18	0.2422	807
63,456	239.28	0.3371	1,257
596,921	$1,460.13	$0.2526	842

Like Building No. 5 (Table 1), reporting gas consumption on steam in a four-family house with gas-designed steam boilers, it was noted that there was a decided difference in the quantity of gas used per apartment in four suites of exactly the same size, each equipped with same kind and style of gas-designed hot water boilers, and indicating further what differences may be looked for because of different heat exactions and care, or lack of care, in operation.

A rather interesting comparison can be made of cost in dollars and cents between these two four-family houses. It happens that the same make of gas-designed steam and hot water boilers are installed in these two places.

Building No. 5 (Table 1) reports 43,200 cu. ft. of contents.

Building No. 22 (Table 4) reports 78,944 cu. ft.

Therefore, Table 4 shows 83% more cubical space than Table 1.

The season heating for steam in Building No. 5 shows a cost of $112.95; in Building No. 22, for hot water $108.99. By adding 83% to the cost in Building 5, it would show a total cost of $206.69 against $108.99 for hot water in Building 22.

Table 7 reports a minimum consumption of 583 cu. ft. of gas per 100 cu. ft. of contents through gas-designed warm air furnaces against a maximum of 1,403 cu. ft. In coal warm-air furnaces equipped with burners, it shows a minimum of 875 cu. ft. of gas and 1,954 cu. ft. as the maximum.

Summary in Table 7 shows an aver-

TABLE 2.—STEAM AND VAPOR GAS HEATING.—BURNERS AND COAL BOILERS.

No. of Building.	Contents, Cu. Ft.	Sq. Ft. of Radiation.	Cost per Season.	Season's Cost per Sq. Ft. of Radiation.	Season's Consumption per Sq. Ft. of Radiation, Cu. Ft.
Steam.					
11	23,040	553	$86.67	$0.1566	522
12	59,340	882	186.30	0.2112	704
13	32,000	595	133.71	0.2247	749
14	17,316	312	86.61	0.2775	925
15	465,000	3,457	1,039.50	0.3006	1,002
	596,696	5,799	$1,532.79	$0.2643	881
Average cost per 100 cu. ft. contents.....					$0.2567
Average consumption per 100 cu. ft. contents, cubic feet.....					856
Vapor.					
16	36,450	690	$101.49	$0.1470	490
17	63,000	767	149.37	0.1947	649
18	22,680	325	83.19	0.2559	853
19	23,328	362	103.26	0.2852	951
	145,458	2,144	$437.31	$0.2040	680
Average cost per 100 cu. ft. contents.....					$0.3007
Average consumption per 100 cu. ft. contents, cubic feet.....					1,002

Fig. 23. Frame house, 27 x 48 x 18 ft., with ten rooms and bath. Moderately exposed. 72° F. maintained.

Fig. 29. Frame house, 32 x 37 x 18 ft., with nine rooms and bath. Exposure moderate. 72° F. maintained.

Fig. 33. Nine-room frame dwelling, 40 x 40 x 18 ft. Heated by four triple copper-coil independent or tank gas water heaters. 70° F. maintained.

Fig. 22. Four-family apartment house. Suites 1 and 2 have each 360 sq. ft. of radiation, Numbers 3 and 4, 368 sq. ft. Six rooms in each apartment. One tenant maintains 75° F., others 70° F.

Fig. 25. Frame house, with 20 rooms and four baths. 1,124 sq. ft. of direct and 70 sq. ft. of indirect radiation. Boiler equipped with heat regulator. 72° F. maintained. Extreme exposure.

Fig. 26. Eight-room frame house, 30 x 30 x 18, extreme exposure. Heat regulator installed. 70° F. maintained.

Fig. 24. Frame house, 30 x 36 x 18 ft. 70° F. maintained.

Fig. 28. Ten-room frame house, 40 x 40 x 18 ft. Heat regulator attached. 70° F. maintained.

Fig. 30. Frame house, 38 x 25 x 18 ft., nine rooms and bath. 70° F. maintained.

Fig. 31. Frame house, 23 x 29 x 18, with six rooms and bath. 72° F. maintained.

Fig. 21. Children's day nursery, 22 x 75 x 20 ft. Moderate exposure. 70° F. maintained.

Fig. 27. Frame house, 32 x 34 x 18 ft., with ten rooms. Heat regulator attached. 70° F. maintained.

Fig. 34. Frame residence, 36 x 36 x 20 ft., with twelve rooms and bath.

age consumption for each 100 cu. ft of contents for warm air heating in gas designed furnaces of 849 cu. ft. of gas against 1,148 cu. ft. for burners in coal warm air furnaces.

Table 8, general summary, reports gas used as actually shown by metered consumption detailed in Tables 1 to 6, inclusive, regardless of whether or not the figures were consistent. To show how

Fig. 20. House with eight rooms and bath, 33 x 51 x 18 ft. Extreme exposure. 72° F. maintained by heat regulator attached to gas-designed hot water boiler.

Fig. 35. Frame residence, 51 x 43 x 18 ft., with eleven rooms and two baths. Heat regulator installed on gas line to water heaters. 68° F. maintained. Exposure moderate.

Fig. 32. Ten-room frame residence, 24 x 40 x 18 ft., extremely exposed. 72° F. maintained.

TABLE 3.—STEAM AND VAPOR GAS HEATING.—SUMMARY OF AVERAGE COSTS OF ALL CLASSES UNDER THIS HEADING.

Contents, Cu. Ft.	Season's Cost.	Season's Cost Contents. per 100 Cu. Ft.	Season's Consumption per 100 Cu. Ft. Contents, Cu. Ft.
1,563,412	$1,837.56	$0.1175	392
33,000	135.09	0.4094	1,365
596,696	1,532.79	0.2567	856
145,458	437.31	0.3007	1,002
2,338,566	$3,942.75	$0.1686	562

TABLE 4.—HOT WATER HEATING.—GAS DESIGNED BOILERS.

Hot Water.

No. of Building.	Contents, Cu. Ft.	Sq. Ft. of Radiation.	Cost per Season.	Season's Cost per Sq. Ft. of Radiation.	Season's Consumption per Sq. Ft. of Radiation, Cu. Ft.
20	30,294	900	$61.50	$0.0684	228
21	61,660	1,397	100.62	0.0720	240
22	78,944	1,456	108.99	0.0749	249
23	23,328	823	63.27	0.0768	256
24	19,440	618	50.07	0.0810	270
25	92,016	1,194	115.44	0.0966	322
26	16,200	499	51.06	0.1023	341
27	19,584	616	64.83	0.1053	351
28	28,800	657	93.33	0.1422	474
29	21,312	505	73.14	0.1448	483
30	18,387	445	66.21	0.1488	496
31	12,006	341	55.59	0.1632	544
32	17,280	431	88.62	0.2055	685
	439,251	9,882	$992.67	$0.1004	335

Average cost per 100 cu. ft. contents..... $0.2260
Average consumption per 100 cu. ft. contents, cubic feet.....753

GAS DESIGNED TANK WATER HEATERS.

33	28,800	659	$61.38	$0.0931	310
34	25,920	721	72.60	0.1008	336
35	39,494	739	94.20	0.1275	425
	94,214	2,119	$228.18	$0.1077	359

Average cost per 100 cu. ft. contents..... $0.2422
Average consumption per 100 cu. ft. contents, cubic feet.....807

inconsistent they prove, note the total for gas consumed per 100 cu. ft. of contents for houses and buildings of all kinds, 634 cu. ft. of gas (Table 8) against 950 cu. ft. (Table 9), with large buildings eliminated and inconsistent figures omitted.

Table 9, with large buildings and inconsistent figures not included, summarizes as follows, for gas consumed per 100 cu. ft. of contents:

	Cubic Feet.
Hot water heating	842
Warm air heating	981
Steam and vapor heating	1,127
Average	950

If our groups of installation may be construed as proper and to represent a true average, generally speaking, hot water heating is cheapest, warm air next, costing 14.2% more than hot water, and steam highest, costing 25.30% more than hot water and 13% more than warm air.

One of the manufacturers of gas-designed steam and hot water boilers recently had a table of costs showing month by month from winter of 1909-1910 to 1914-1915, inclusive, cost for gas consumed in a gas-designed water boiler. Table is noted below to show how consistent this owner's costs have been for six winters. This boiler was used in a two-story brick and shingle building with tile roof. The outside dimensions were 30 x 42 x 18 ft. Eleven radiators were installed which combined a radiation of 700 sq. ft.

The average day and night temperature maintained was 74½° F. Water temperature at zero, 170° F.

To secure these figures a deduction was made from total bill of $1.20 per month for cooking, laundry and water heating.

	1909 1910	1910 1911	1911 1912	1912 1913	1913 1914	1914 1915
November	$ 5.00	$ 7.50	$ 7.80	$ 6.00	$ 9.00	$ 5.70
December	8.00	12.30	12.00	10.50	8.40	12.60
January	11.90	12.40	13.50	13.80	14.70	14.40
February	9.90	12.60	21.00	14.10	14.10	14.40
March	12.00	9.00	13.20	17.10	15.90	11.10
April	5.10	13.50	8.10	4.80	8.40	9.60
	$51.90	$69.30	$75.60	$66.30	$70.50	$67.80
Average per sq. ft. rad.	6.4c	8.8c	9.8c	8.4c	9.0c	8.6c
Av. outside temperature, deg. F.	36°	34°	31°	37°	35°	....

Fig. 36. Twelve-room frame house, 54 x 28 x 18 ft. Exposure moderate. 70° F. maintained.

Fig. 37. House, 50 x 140 x 27 ft., with 40 rooms. 70° F. maintained.

Fig. 38. Eight-room frame house, 33 x 31 x 18 ft. Gas burners in coal-designed hot water boiler. Extreme exposure. 70° F. maintained.

Fig. 39. Brick and frame house, 32 x 33 x 18, with eleven rooms and bath. Gas burners installed in coal-designed boiler. Temperature maintained at 78° F. Exposure moderate.

DESCRIPTION OF INSTALLATIONS TESTED.

The illustrations following picture four kinds of gas-designed hot water boilers. No photographs are shown of any of the same makes of gas-designed steam boilers, for there is little difference in the outside appearance. Boilers used for steam are larger, so that part of the space at the top is used as a steam dome. Fig. 1 shows the gas-designed hot water boiler installed as an auxiliary beside the coal boiler in Building No. 20.

The copper coil gas-designed hot water boiler shown in Fig. 2 heats Building No. 23. This boiler is connected as auxiliary to the coal boiler.

The huge gas-designed hot water boiler shown in Fig. 3 heats Building No. 25. It is of cast-iron sections and is connected as an auxiliary to the coal boiler.

The cast-iron sectional gas-designed hot water boiler shown in Fig. 4 heats Building No. 28. This boiler is connected as auxiliary to the coal boiler.

A photograph is shown in Fig. 5 of four tank or independent gas water-heaters which heat Building No. 34. These are what are known as triple copper-coil water heaters. Each heater contains 27 ft. of coil. They are connected as can be seen, as an auxiliary system to the coal boiler. A heat regulator controls the gas supply to the heaters.

The eight double copper copper-coil tank water-heaters, connected as auxiliary to coal boiler cannot be seen in Fig. 6, because the owner of this home (No. 35) has encased them in a sheet iron jacket to prevent heat loss through radiation. Jacket can be seen to left at rear of boiler. Each heater contains 22 ft. of copper coil. The gas supplied to these heaters is controlled with a heat regulator. Note comparison in size between gas and coal installation. Coal boiler would not heat home properly.

Fig. 7 shows the coal-designed hot water boiler equipped with gas burners installed in Building No. 38.

Another style of coal-designed hot water boiler fitted with gas burners is shown in Fig. 8. It heats Building No. 39. It is hardly necessary for me to say this is not the most desirable location for a meter.

There are many ways of installing burners in coal-designed steam and hot water boilers. We are not so egotistical as to think or say our's is the best possible way of making burner installations. It is the best way we have found to date, and we can recommend it as satisfactory for most installations.

Fig. 9 shows a front view as it appears with burners installed in a steam or hot water coal-designed boiler. First the grates are removed and a piece of sheet iron is fitted at the bottom of the boiler

TABLE 5.—HOT WATER HEATING.—BURNERS IN COAL BOILERS.

Hot Water.

No. of Building.	Contents, Cu. Ft.	Sq. Ft. of Radiation.	Cost per Season.	Season's Cost per Sq. Ft. of Radiation.	Season's Consumption per Sq. Ft. of Radiation, Cu. Ft.
36	27,216	749	$68.04	$0.0909	303
37	189,000	2,830	399.78	0.1413	471
38	17,232	671	96.03	0.1431	477
39	19,008	316	75.21	0.2379	793
	252,456	4,566	$639.06	$0.1399	466

Average cost per 100 cu. ft. contents..... $0.2531
Average consumption per 100 cu. ft. contents, cubic feet.....844

TABLE 6.—HOT WATER HEATING.—SUMMARY OF AVERAGE COSTS OF ALL CLASSES UNDER THIS HEADING.

Contents, Cu. Ft.	Season's Cost.	Season's Cost per 100 Cu. Ft. Contents.	Season's Consumption per 100 Cu. Ft. Contents, Cu. Ft.
439,251	$992.67	$0.2260	753
94,214	228.18	0.2422	807
252,456	639.06	0.2531	844
785,921	$1,859.91	$0.2367	789

Fig. 41. House, 40 x 30 x 18 ft., with eight rooms and bath. No coal furnace in this house. 70° F. maintained during daytime, 60° F. during nighttime. Heat regulator attached to gas line supplying furnace. Fresh air taken from outside.

Fig. 42. Seven-room dwelling, 32 x 26 x 18 ft., warm air furnace connected as auxiliary to coal furnace. Extremely exposed. 65° F. maintained. Air taken from basement. Owner reports coal cost previous winter of $52.

Fig. 45. Eight-room frame residence, 60 x 36 x 18 ft., with gas burners in a coal-designed warm air furnace, with heat regulator attached. 75° F. maintained. Air taken from both inside and outside.

Fig. 46. Eight-room frame house, 16 x 48 x 16 ft., with gas burners installed in coal-designed warm air furnace. Half of double house and has three sides exposed. 70° F. maintained. Air taken from basement.

Fig. 40. Frame house, 36 x 51 x 18 ft., with eight rooms and bath. 75° F. maintained. Air taken from basement. Owner reports using anthracite coal previous winter at a cost of $83.

Fig. 43. House, 36 x 36 x 18 ft., with twelve rooms and bath. Extreme exposure. Gas-designed warm air furnace connected as auxiliary to coal furnace. 72° F. maintained.

Fig. 44. Frame dwelling, 19 x 27 x 18 ft. Gas burners installed in coal warm-air furnace. 70° F. maintained. Air taken from basement. Owner reports coal cost previous winter of $52.

Fig. 47. Frame house, 23 x 27 x 18 ft., six rooms and bath. 72° F. maintained. Air taken from basement. Consumer reports coal cost of $50 the previous winter.

TABLE 7.—WARM AIR GAS HEATING.—GAS DESIGNED FURNACES.

Warm Air.

No. of Building.	Contents, Cu. Ft.	Season's Cost.	Season's Cost per 100 Cu. Ft. Contents.	Season's Consumption per 100 Cu. Ft. Contents, Cu. Ft.
40	33,048	$57.75	$0.1749	583
41	21,600	41.31	0.1914	638
42	14,976	39.21	0.2619	873
43	23,328	98.28	0.4209	1,403
	92,952	$236.55	$0.2546	849
BURNERS IN COAL FURNACES.				
44	38,880	$102.06	$0.2625	875
45	13,924	44.64	0.3207	1,069
46	11,178	51.30	0.4590	1,530
47	9,234	54.12	0.5861	1,954
	73,216	$252.12	$0.3443	1,148

SUMMARY.

Contents, Cu. Ft.	Season's Cost.	Season's Cost per 100 Cu. Ft. Contents.	Season's Consumption per 100 Cu. Ft. Contents, Cu. Ft.
92,952	$236.55	$0.2546	849
73,216	252.12	0.3443	1,148
166,168	$488.67	$0.2942	981

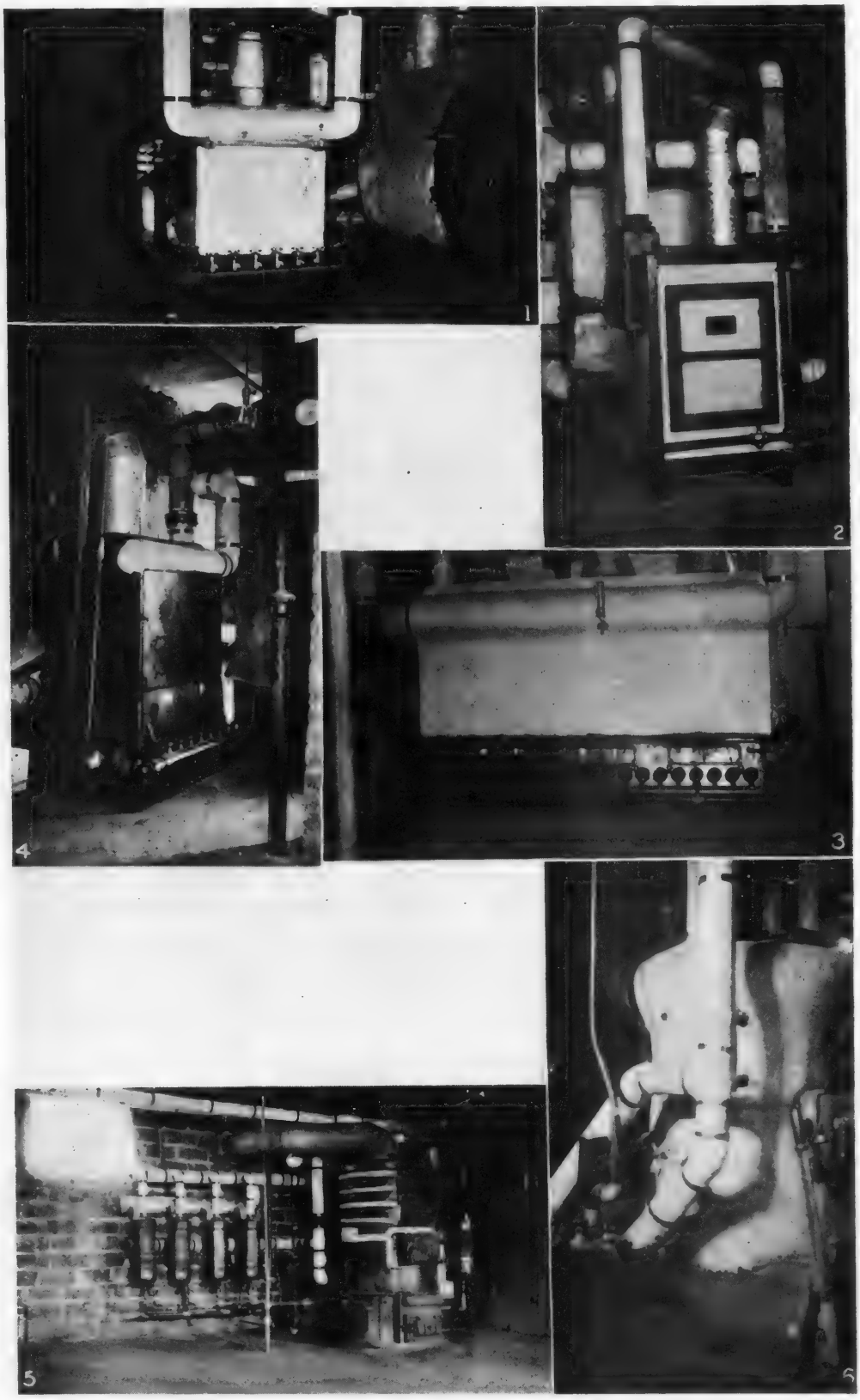
TABLE 8.—GENERAL SUMMARY.

	Contents, Cu. Ft.	Sq. Ft. Rad.	Season's Cost.	Season's Cost per Sq. Ft. Rad.	Season's Consumption per Sq. Ft. Rad., Cu. Ft.	Season's Cost per 100 Cu. Ft. Contents.	Season's Consumption per Cu. Ft. Contents, Cu. Ft.
Gas designed boilers, steam	1,563,412	11,877	$1,837.56	$0.1547	516	$0.1175	392
Gas designed boilers, vapor	33,000	801	135.09	0.1687	562	0.4094	1,365
Coal designed boilers, steam	596,696	5,799	1,542.79	0.2645	882	0.2567	856
Coal designed boilers, vapor	145,548	2,144	437.31	0.2039	680	0.3007	1,002
Gas designed boilers, water	439,251	9,882	992.67	0.1004	335	0.2260	753
Coal designed tank heaters, water	94,214	2,119	228.18	0.1077	359	0.2422	807
Coal designed boilers, water	252,456	4,566	639.06	0.1399	466	0.2531	844
Gas designed furnaces, air	92,952	....	236.55	....	....	0.2546	849
Coal designed furnaces, air	73,216	....	252.12	....	....	0.3443	1,148
		GRAND	TOTALS.				
Steam and vapor gas heating	2,338,566	....	$3,942.75	....	....	$0.1686	562
Hot water gas heating	785,921	....	1,859.91	....	....	0.2367	789
Warm air gas heating	166,168	....	488.67	....	....	0.2942	981
Average cost of heating, all kinds	.....	....	.....	....	....	0.1902	634

TABLE 9.—ELIMINATING LARGE BUILDINGS.—HOME GAS HOUSE-HEATING ONLY.

	Contents, Cu. Ft.	Sq. Ft. Rad.	Season's Cost.	Season's Cost per Sq. Ft. Rad.	Season's Consumption per Sq. Ft. Rad., Cu. Ft.	Season's Cost per 100 Cu. Ft. Contents.	Season's Consumption per 100 Cu. Ft. Contents, Cu. Ft.
Gas designed boilers, steam	116,836	2,275	$378.24	$0.1667	554	$0.3240	1,080
Gas designed boilers, vapor	33,000	801	135.09	0.1687	562	0.4094	1,365
Coal designed boilers, steam	131,696	2,342	493.29	0.2104	702	0.3747	1,249
Coal designed boilers, vapor	143,458	2,144	437.31	0.2040	680	0.3007	1,002
Gas designed boilers, water	439,251	9,882	992.67	0.1004	335	0.2260	753
Gas designed boilers, tank heaters	94,214	2,119	228.18	0.1077	359	0.2422	807
Coal designed boilers, water	63,456	1,736	239.28	0.1377	459	0.3771	1,257
Gas designed furnaces, air	92,952	....	236.55	....	....	0.2546	849
Coal designed furnaces, air	73,216	....	252.12	....	....	0.3443	1,148
		GRAND	TOTALS.				
Steam and vapor gas heating	426,990	7,562	1,443.93	$0.1909	636	$0.3381	1,127
Hot water gas heating	596,921	13,737	1,460.13	0.1062	354	0.2526	842
Warm air gas heating	166,168	....	488.67	....	....	0.2942	981
Average cost of house-heating, all kinds	.....	....	.....	....	....	0.2851	950

Note.—This table does not include figures shown in Summary (Table 8) or Tables 1, 2, 3, 4, 5, 6 and 7 and Buildings Nos. 1, 4, 6, 7, 15, 37 and 44.



TYPES OF GAS HEATERS INSTALLED IN THE BUILDINGS TESTED.

on the grate rests. This is purposely made not to fit too snugly at the sides, front and back and holes are cut a trifle too large for burner supply pipes to allow enough secondary air to pass through to support combustion.

Mixers, as will be observed, are in the ash-pit below sheet-iron plate. Side burners are installed from front to back above sheet-iron bottom parallel to side walls. In the center, round heater burners are installed. Between center and side burners are placed rows of fire brick. Over the side burners are checked fire brick which deflect the heat against the water legs.

Above this, broken fire brick is thrown in, which tends to maintain a high flame temperature and at the same time hold back the products of combustion. The side burners only are used except when temperature is at zero or below, when it may be necessary to use center burners for quick heat.

Fig. 10 shows view of burner installation in steam or hot water boiler looking down from the top.

Fig. 11 shows a gas-designed warm air furnace installed as an independent or direct furnace, and heats Building No. 41. It is controlled by a heat regulator. Pilot can be seen lighted through open door. As in Fig. 8, sub-meter is badly located.

A view of the rear of both the coal and gas furnaces showing method of connecting gas-designed furnace as auxiliary to coal warm air furnace is shown in Fig. 12.

In this installation, which heats Building No. 42 fresh air supply may be taken through fresh air duct leading to coal furnace from outside or from cellar floor.

Fig. 13 shows a large size gas-designed warm air furnace connected as auxiliary to coal furnace for heating Building No. 43. One direct heating lead is taken from top of gas furnace, balance of leads are connected from coal furnace.

A coal-designed warm air furnace fitted with gas burners is shown in Fig. 14. This furnace heats Building No. 47.

Like burner installation illustrated and described for steam and hot water boilers, the burner installation shown in Fig. 15 is the best we have found to date for use in coal designed warm air furnaces.

Burners like these are used in round steam and hot water coal boilers as well as warm-air coal furnaces. The efficiency is not as great as we should like to have it, but for a cheap serviceable installation it answers every practical purpose. After removing grates from coal furnace a sheet-iron plate is cut to not too snugly fit in fire pot on grate rests, and holes are cut to allow burner supply pipes to pass through, somewhat larger than needed to provide enough secondary air to support combustion. A sunflower type of sectional burner of two, three or four sections is used whose diameter is somewhat smaller than the fire pot, at point where burner is installed. Whole fire brick are then laid on the top of the burner in the center and checked brick around the edge of the fire pot, one resting on burner, the other against fire pot to deflect heat against fire pot. Later broken fire brick is thrown in to help maintain a high flame temperature and to hold back the products of combustion. Enough broken fire brick may be used to bring top level up to 3 or 4 in. of bottom of fire door.

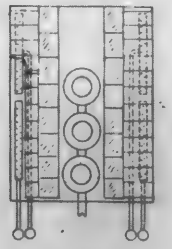
ECONOMY OF GAS DESIGNED HEATERS.

Gas-designed boilers and furnaces are unquestionably cheaper to operate than any burner that possibly could be installed in coal boilers or furnaces.

As much economy in gas consumption should be practiced as possible in making burner installations, even in those sections where coal is sold at a high price, for the time will come when natural gas will not be so plentiful as it is today and we will have need then, if not now, to meet competition in other fuels, because of probable advances in cost of gas.

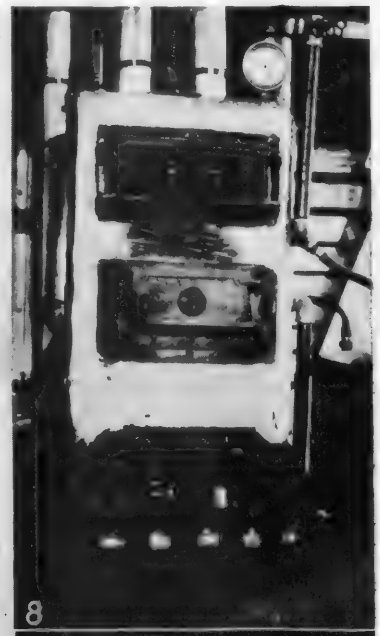
Experiments are constantly being made in the effort to learn better ways for applying gas to coal-designed house heating appliances. We have learned of some refinements in our present installations to increase efficiency and are about to try them out in actual practice following our laboratory tests, but are not prepared to advocate them until we ascertain how practical they may prove.

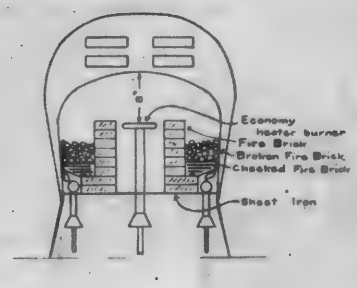
Manufacturers of gas-designed house



Burner Installation in Coal Boiler

10





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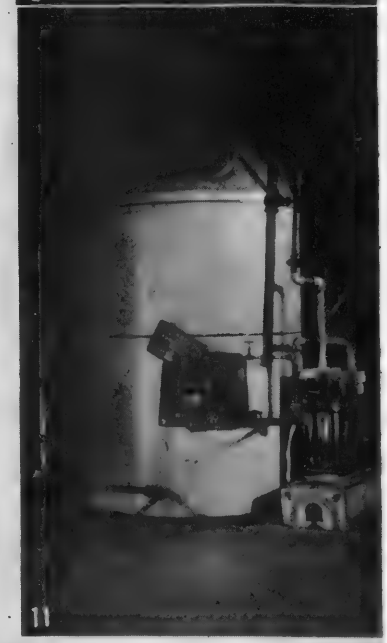
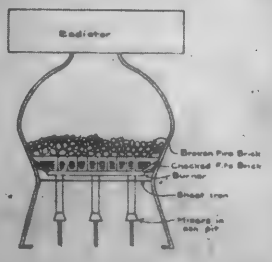




Burner Installation in Hot Air Furnace

15

TYPES OF GAS HEATERS INSTALLED IN THE BUILDINGS TESTED.

TYPES OF GAS HEATERS INSTALLED IN THE BUILDINGS TESTED.

heating boilers and furnaces are also hard at work, constantly endeavoirng to improve the efficiency of their product and the future will doubtless see wonderful strides in this direction.

Discussion.

In the discussion of the paper it was brought out that as much care is required in the manipulation of the check draft on the flue pipe leading from the coal furnace as is required in any other portion of the apparatus. A safety damper is favored, having a hole in the center. This is kept closed as much as possible without smothering the flames in the furnace. Some of the heat must be allowed to escape to carry away the products of combustion, otherwise there would be moisture in the flue pipe or chimney which sometimes causes trouble by seeping through the brick in the chimney and ruining the decorations in the home.

In reply to a question as to why the mixers are placed directly under the grates rather than in front of the fire pot door, it was stated that there is some heat radiation in the iron plate at the bottom of the furnace and it preheats the air somewhat to have the air mixers in the ash pit.

Combination coal and gas furnaces, it appeared from the discussion, are not very satisfactory for gas. The burners installed in them are wasteful of gas for the reason that the heat is not applied at the proper point.

One speaker asked if some of the low operating cost figures obtained might not be due to the prolonged absence of a family. He was informed that no watch was kept over the houses in this connection. It was admitted that some of the costs were very low.

New Apparatus for Testing Heat Losses

In connection with an elaborate project for revising practically all of the existing so-called standard coefficients for calculating heat transmission through building materials, radiators, etc., some of the recent work done in this direction at the University College in London is described by A. H. Barker, B. Sc., in *Domestic Engineering* (London).

It will be recalled that some time ago the (British) Institution of Heating and Ventilating Engineers formed a committee for the express purpose of carrying out this work and the committee has requested the heating and ventilating department of the University College to take the lead in the experimental part of the work.

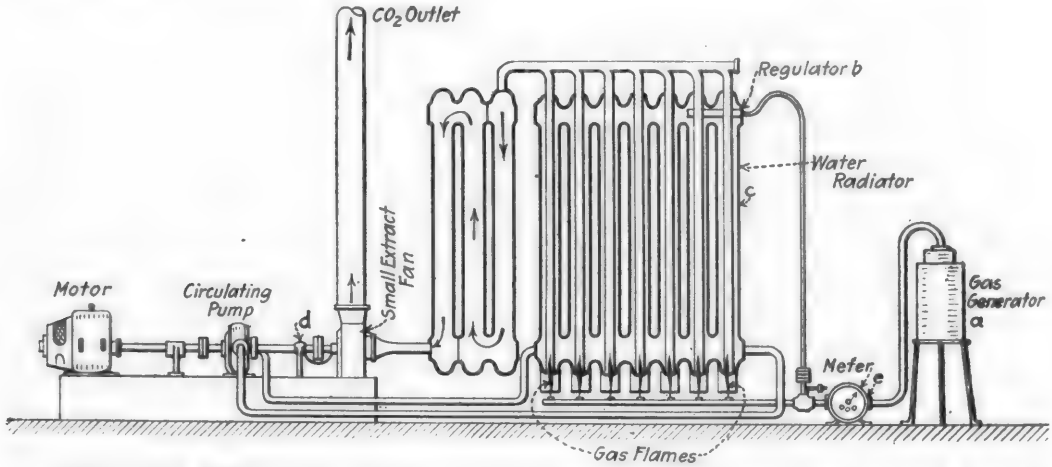
In answer to the question, "What do we require for practical purposes?" Mr. Barker expresses the opinion that we require to find the absolute values and not merely the proportional magnitudes of a set of coefficients, such that if they are adopted in connection with a correct and scientific method of calculation from the area of walls, roof, windows, etc., the result secured will be one which a customer will generally find satisfactory; which will, in other words, with a freezing temperature outside, maintain a suitable feeling of warmth which may be taken to correspond to an approximate temperature of 60° or 65° F. indoors, with heating interrupted during the night. We desire further to know as nearly as possible the practical effect on the transmission and on the temperature of variations in the interruption of heating, outdoor conditions, such as wind, rain, sunshine, etc.

PORTABLE APPARATUS REQUIRED.

One of the first requisities determined by previous experiments, is a portable apparatus consisting of radiators and means for heating them, which can be installed in a room without much difficulty. The essential features of such an apparatus are that it can be heated to any desired degree, that the exact amount of heat given off from it can be measured, and finally, that it must be self-contained and light.

APPARATUS FOR MEASURING HEAT LOSSES FROM ROOMS.

Such an apparatus, designed by Mr. Barker for determining the heat losses from rooms, is shown in Fig. 1. a is an acetylene generator capable of generating a considerable volume of acetylene or other gas, as may be necessary to supply heat to the radiator; b is a regulator surrounded on all sides by water for maintaining at a constant value the temperature of the water in the radiator. The regulator may also be arranged to be operated by the temperature in the room.



APPARATUS DESIGNED BY A. H. BARKER FOR MEASURING HEAT LOSSES FROM ROOMS.

c is a radiator of special make containing tubes so arranged that the water can be heated in it by the combustion of gas generated in the apparatus a. d is a small air pump for abstracting the waste gases. There is an additionl pump for maintaining a constant circulation of water in the radiator, the pipes on the heater being made long enough to absorb practically the whole of the heat from the waste gases almost down to the temperature of the water. Several of the radiator coils might be used as shown for further abstracting the heat from the gases. e is a self-registering gas meter.

HOW THE APPARATUS OPERATES.

The method of observation is as follows:

First measure the acetylene gas used and make a careful determination of the calorific value of the same. Then light the burners and set the motors at work. The vitiated gases are drawn off through the coil in which most of the heat of combustion of the gas is abstracted and then discharged into the room at several different points.

In this way the radiator may be maintained at any required temperature which is automatically regulated to suit the desired temperature conditions in the room. Careful and continuous observation has to be made by means of continuously recording thermometers of the inside and outside temperatures, wind, etc., and continuous observation also made of the interchange of air. The latter may be accomplished through a carbonic acid test.

In testing rooms having fixed heating apparatus, it is proposed to produce the CO_2 by the combustion of weighed quantities of sperm candles. If the method above outlined is used for rooms having no existing heating apparatus, the quantity of CO_2 can be measured by the same means used in producing the heat.

The gas, acetylene, which is used, is of known composition and known calorific value, and the quantity of CO_2 produced by the combustion of a known volume of it can be calculated easily. Therefore, to obtain the interchanges it is only necessary to analyze the air continuously and make calculations on the result.

LENGTHY TESTS NECESSARY.

These experiments would have to be conducted until the room attained a constant temperature which would have to be maintained thereafter. The hourly consumption of heat in maintaining this temperature would have to be calculated from the consumption of gas and careful calculations made of the dimensions of the room, the temperature on each side of every wall and all other matters having a bearing on the loss of heat from the room.

The actual amount of heat loss would then be compared with the calculated amount, based on the given inside and outside temperatures. If the present coefficients are found to be in error, then the laboratory experiments here indicated will furnish the relative proportion of the respective coefficients. If this process were carried out for a large number of rooms, a very reliable set of figures could be obtained.

In Mr. Barker's opinion, each room should be experimented on during cold weather for at least one week and it is estimated that this would require the entire time of two men. It is proposed to obtain permissions from owners of unused houses, preferably furnished, for the experiments.

DESIGN OF APPARATUS FOR MEASURING RADIATOR HEAT TRANSMISSION.

The experiments should not, of course, be confined to dwelling houses, but the size of testing apparatus necessary to conduct a similar test on a large hall, for instance, would be considerable. For this reason large buildings would have to be tested with radiators already provided. It might be sufficient to make tests of a plant by taking frequent readings of the surface temperatures of each of the radiators and calculating the heat given off from each. In order to do this it will be necessary to develop considerably the methods which we have at present for determining the actual value of the surface temperature of radiator or pipes.

Mr. Barker then described what had already been accomplished in this direction by his staff, using the principle of resistance thermometers. The method is

to attach a known resistance to the surface of a flexible non-conducting envelope, such that it can be pressed into contact with the surface, the assumption being that the coil will take up the temperature of the surface. Special methods of calibration, of course, would be required.

Humidity and Its Measurement

By KENNETH G. SMITH.*

According to the law of partial pressures, commonly known as Dalton's Law, two gases at the same temperature do not interfere with each other's pressures when mixed, provided there is no chemical action. Each one exerts the same pressure that it would at the given temperature if the other were not present. The total pressure is the sum of the pressures of the two gases. Experiment shows that this law holds good for a mixture of gas and vapor, such as water vapor and air. Taking water vapor and air as an example, if Pa is the air pressure and Po the vapor pressure, then Pa + Po = Pt = total pressure of vapor and air.

If the vapor is saturated, the temperature of the mixture is definitely fixed at the saturation temperature corresponding to the pressure Pt. If the temperature is higher than the saturation temperature at the given pressure, the vapor is superheated. Water vapor in the atmosphere is superheated except on damp, foggy days when the water vapor is saturated or, as we say, the air is saturated with moisture.

The weight of 1 cu. ft. of superheated vapor is less than the weight of 1 cu. ft. of saturated vapor. If m_1 is the weight of a cubic foot of saturated vapor and m_2 = weight of a cubic foot of superheated vapor at the same temperature, then the ratio $\frac{m_2}{m_1}$ expressed in per cent. is the relative humidity of the air containing the vapor. That is, it is the ratio of the moisture actually contained in the air to that which the air could contain at that temperature if saturated.

If a mixture of air and superheated vapor is cooled at constant pressure (say atmospheric pressure), it will finally reach a point where the vapor becomes saturated instead of superheated and further results in condensation. The temperature at which condensation begins, that is the dew point is simply the saturation temperature for the given pressure. The gas law PV = constant, which we may assume holds good for low vapor pressures, gives us the means of calculating the ratio $\frac{m_2}{m_1}$ referred to above as the relative humidity.

Let P_1 V_1 represent the condition of saturated vapor at the given temperature and P_2 V_2 its actual condition at this temperature, that is, in its superheated state.

$$P_2 V_2 = P_1 V_1 \text{ and } \frac{P_2}{P_1} = \frac{V_1}{V_2}$$

Consider now that the vapor is cooled at a constant pressure P_2 down to the saturation temperature, that is, to the dew point. Since P_2 is unchanged the ratio $\frac{P_2}{P_1} = \frac{V_1}{V_2}$ still holds good. If now we substitute for the volumes per cubic foot, their reciprocals, the weight per cubic foot, we have $\frac{P_2}{P_1} = \frac{m_2}{m_1}$

Hence, the relative humidity in per cent. is equal to the ratio of the pressure (corresponding to the dew point) to the saturation pressure (corresponding to the temperature of the mixture).

A TYPICAL EXAMPLE.

An example will make this method of measuring humidity clear. Suppose that air has a temperature of 70°F. and the dew point is found to be 55°F. What is the humidity and weight of vapor per cubic foot? From a table of vapor pressure we find that at 55° the saturation pressure is 0.436 in. of mercury. At 75° the saturation pressure is 0.8735 in. of mercury. The relative humidity is then

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$\frac{0.436}{0.8735}$ = 50 per cent., very nearly. If the air were saturated at 75° it would contain 9.36 grains of moisture per cubic foot. Hence, at 50 per cent. saturation it contains $9.36 \times 0.5 = 4.68$ grains per cubic foot.

To measure moisture in this way would be difficult under other than laboratory conditions and for that reason the method using a wet and dry bulb thermometer is more generally used. The dry bulb thermometer is simply an ordinary Fahrenheit thermometer. The wet bulb thermometer is exactly the same except that it has a piece of muslin or other porous material wrapped around the bulb and saturated with water. When both are exposed to the air, the wet bulb thermometer immediately falls to a lower temperature than the dry bulb thermometer, due to the fact that the evaporation of the moisture in the cloth requires heat. The drier the air, the more the evaporation and the greater the drop in temperature. From the difference in temperature between the wet and dry bulb thermometers the humidity may be calculated. In practice it is not calculated but read directly from a table or curve.

EXPLANATION OF WET BULB TEMPERATURES.

One might naturally ask the reason for the fixed temperature to which the wet bulb thermometer drops. This temperature is known as the temperature of adiabatic saturation and is fixed for any dry bulb temperature and percentage of humidity. To understand this statement imagine three thermometers placed in a body of air to which moisture is to be added without exchange of heat with any source outside of the air and water. The first thermometer is arranged to show the dew point and reads the lowest. The second or dry bulb thermometer shows the dry bulb temperature or as we call it, the temperature of the air. The third thermometer shows a temperature between the dry bulb temperature and the dew point. To make the case concrete let us consider air at 70° and 33 per cent. saturated. Conditions are then as follows:

Dry bulb temperature.....	70°
Dew point.....	39°
Wet bulb temperature.....	54°

If now a fine spray of water having a temperature higher than 39° is introduced, the air absorbs moisture with the result that the dry bulb temperature drops at once, the dew point temperature rises and the wet bulb temperature remains stationary. The reason is that the total heat of the air is constant. The heat required to evaporate the moisture is rendered latent and the sensible heat as shown by the dry bulb thermometer becomes less, but the sum of latent and sensible heat is constant. If moisture continues to be added the dew point temperature continues to rise, the dry bulb temperature continues to fall until all three are stationary at the wet bulb temperature, when the air is saturated. The total heat of the air is the same as it was before the moisture was added, but it contains more latent and less sensible heat. On the total heat the wet bulb temperature depends, and, therefore, it is fixed for any temperature and percentage of humidity, because the total heat of the air in the given condition is fixed.

In the above example the percentage of humidity may be calculated if we know the dry and wet bulb temperatures. These are as given, dry bulb 70°, wet bulb 54°, 54° is the temperature of adiabatic saturation and at this temeprature the air contains 62.14 grains per pound when saturated. The total heat of the mixture equals the heat of the air plus the heat of the moisture $= 0.2375 \times 54 + \frac{1084.7 \times 62.14}{7000} = 22.44$ B. T. U. Since the total heat of the air is constant during the change the total heat at 70° equals the total heat at 54°.

$0.2375 \times 70 + (1084.7) + (48 \times 16) \times X = 22.44$.

X = grains of moisture in air at 70°.

0.48 = specific heat of the vapor.

Solving for X we have X = 37.2 grains per pound of air.

Since saturated air at 70° contains 110.01 grains per pound the humidity is $\frac{37.2}{110.01}$ = 33 per cent.

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A REMARKABLE set of figures is that presented in this issue, showing the operating costs in some 47 buildings, in Cleveland, Ohio, all heated with natural gas as a fuel. Most of the records are for private residences and, with the dimensions given, offer an interesting check on the calculated requirements. While natural gas was the fuel used, the heaters themselves were designed, in some cases, for steam heating and in others for hot water, while still others were in the form of warm air furnaces. The paper supplements very nicely the few data already published on this subject.

One of the most significant features of the investigation was the record of high indoor temperatures in so many of the buildings heated. Not only that, but in many cases the high temperatures were distinctly specified and provided for, running from 74° F. as high as 87° F. Here we have confirmation of the general statements so often made that Americans habitually live in over-heated houses. This, too, in a climate that compares favorably for sharp winter weather with that of any of our colder sections.

The most recent researches have shown the most desirable indoor temperature to be 68° F., with a relative humidity of 42%, or as Dr. Hill, of the Chicago division of ventilation, expressed the requirements to be met in testing school equipments: temperature, 68° F.; relative humidity, 42%; air supply, 30 cu. ft. per minute per person; air movement, 2 ft. per second; parts of CO in 10,000, 8; dust count, 100,000 particles per cubic centimeter; bacteria, 12 colonies per three-minute plate.

If this even approximates the ideal, one of the first steps in the impending efforts for the uplift of the art should be a campaign for more reasonable indoor temperatures, for they certainly have a bearing on the practical side of the heating engineer's work.

OUTSIDE of an association gathering, a discussion of "co-operation among heating engineers" is not, as a rule, taken seriously. "Knocking among heating engineers" would be a more likely subject of debate. This is probably true of other industries in their earlier stages. As a profession gets larger the diversity of interests is very often sufficient in itself to bring about a more liberal point of view on the part of those concerned. The difficulty just now with the heating engineer is for him to realize the extent to which his profession has grown. It is difficult to collect statistics, but it may be easily shown that the profession has experienced an astonishing growth in the past decade. It is high time that the habitual "knocker" took a new view of the situation and got in touch with the big forward movement going on in the trade. It is here, and there is enough glory in it for every man Jack in the profession. Try boosting awhile!

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS, C. E.

59—Recent Data on the Recirculation of Air.

QUESTION: Some time ago, in discussing the economy of recirculating air for ventilating purposes, you reached the conclusion that the apparent economy in the fuel bill would be more than offset by the cost of dehumidification which, you showed, would be necessary if no fresh air were admitted to mingle with the vitiated air. Recently a paper was presented before the heating engineers' society that appeared to show the economy of recirculation of the air. Can you reconcile the conclusions reached in this paper with your statements as referred to?

ANSWER: In considering the paper by G. L. Larsen on "Tests on the Recirculation of Washed Air," which is the one referred to by our correspondent, attention should be directed to the conditions under which the test was made, as these conditions would seldom obtain, at least in elementary schools in large cities. The recirculation of the same air, in that case, would certainly reduce the steam consumption over that in using outdoor air. The intermittent flow of condensation, when the thermostats turn on steam, is due to the preliminary heating of the cast-iron radiators which will condense as much as 25 lbs. per square foot per hour under these conditions. This heat is, of course, given up after the steam is turned off.

The reduction in the condensation when the air is recirculated is undoubtedly in accordance with the facts. The radiators are placed under the windows adjacent and the cold air falling on them is heated and rises to the ceiling where the temperature is anywhere from 10° to 20° higher than at the floor.

The operation of the fan in circulating the air from the ceiling to the floor outlet causes the heat to dissipate and distribute, increasing the temperature adjacent to the direct radiators and equalizing the temperatures at the floor and ceiling.

The writer has used this method of recirculation in high shop buildings. By starting the fan and recirculating the air from the roof to the floor level, the temperature 6 ft. from the floor has been raised 10° without supplying additional heat. The reduction of the temperature under the roof, of course, decreases the radiation of heat to the outside through the roof, thus decreasing the heat requirements.

Following are a few figures giving the conditions as described in the test as compared to what might be expected in a large city school:

This is a high school building evidently situated in an open country space, where, if there were no mechanical ventilation provided at all, probably no serious effects would result. Many of the pupils are shifted at intervals from class to recitation rooms. There are also the usual intermissions of recess and lunch periods; in short, probably a shifting of classes during every hour of the session.

All rooms, both occupied and unoccupied, are interconnected through the recirculation ducts so that the air is diffused through the entire building. It will also be noted that there were only 250 pupils average at the time of the test. The figures show that there are 158,540 cu. ft. of space in the class rooms for the 250 pupils, or over 600 cu. ft. per pupil. If the entire cubical contents of the rooms supplied are taken into account, there are 268,684÷250, or 1,460 cu. ft. of space per pupil. Class room 8 shows 800 cu. ft. of space for the student capacity, or, with an attendance of 16, over 1,000 cu. ft. Class room 10 shows about 500 cu. ft., and, for the actual attendance, 680 cu. ft.

In a class room as arranged for an elementary school, there would be provided 216 cu. ft. per pupil, and the attendance would be the maximum or 40 pupils for 5,640 cu. ft. of space.

In the Larsen test, the air supply was 5,726 cu. ft. for the class rooms occupied or 23 cu. ft. per pupil per minute for the pupils actually in attendance. If the total air sup-

ply of 15,000 cu. ft. were taken, it would make 60 cu. ft. per pupil actually in attendance.

THE FIRE RISK A FACTOR.

Another point that is worth considering in this connection is the question of how these return flues to the fan interconnecting the class rooms would affect the carrying of sound, and also the view the fire authorities in a large city would take of the building as a fire risk. Where schools are designed under Massachusetts laws, there are no flues interconnecting and an equal amount of air has to be renewed, as well as supplied.

Referring again to the tests in question, the building is equipped with an air washer capable of handling 30,000 cu. ft. of air per minute and it is only washing 15,000 cu. ft. If this school were in a crowded city, with, say, 60 children per class room and if the pupils were not transferred from room to room and there was no auditorium other than throwing the class rooms together by means of folding doors, the results would be materially different.

The actual air supplied to this school when the amount per pupil and cubic space per pupil are taken into account will be found to be as great, if not more, than that supplied in large elementary schools in cities. With an initial condition of 368,684 cu. ft. of space and with three changes per session, due to leakage and open doors, which would occur when the pupils went to lunch and recess, in five hours the actual air supply would be $(368{,}684 \times 3) \div (250 \times 5 \text{ hrs.} \times 60 \text{ min.}) = 15$ cu. ft. of actual fresh air per pupil, with no allowance for the removal of used products by the air washer and the induced air supply, due to the small ventilating fan in the attic.

On the whole, it is seen that the ventilation is rather liberal under the conditions named. With less cubic space per pupil and figuring on 400 B. T. U. being given up by 40 pupils, this would make 16,000 B.T.U. per hour to be taken care of in reducing the temperature of the air, or nearly the amount of the radiation of the room to the outside.

Milwaukee Local Association.

Following are the officers elected at the annual meeting of the Milwaukee Association of Master Steam and Hot Water Fitters, held in Milwaukee, January 7: President, F. H. Meadows; vice-president, Frank Downey; secretary, Edward Metz; treasurer, Fred Kauffman.

LEGAL DECISIONS

When a Contract Is Binding, Despite the Use of a Printed Clause on Business Stationery.

An important decision was recently secured by the B. F. Sturtevant Co., in the Appellate Division of the New York State Supreme Court, in an action against the Fireproof Film Company, the decision being that when a contract between the parties is clearly expressed on a letter sheet of office stationery, which also contains at the bottom thereof, and printed in small type, certain conditions and exceptions not otherwise referred to, such conditions and exceptions may not be deemed a part of the contract.

The action was brought to recover damages for the breach of an alleged contract. The contract was in the form of a "proposal and specifications," submitted by the B. F. Sturtevant Company and which were endorsed as accepted by the Fireproof Film Company.

After work had been commenced, the Fireproof Film Company stated that the acceptance of the contract should have been submitted to the company's board of directors for approval and asked the Sturtevant company to hold off on its work until further advised. Later, the film company cancelled the contract.

After suit had been brought by the Sturtevant company, the claim was made that the film company did not enter into any contract with the plaintiff, inasmuch as the alleged contract was executed without the necessary authority.

After the case was won by the Sturtevant company in the trial court it was appealed to the appellate division and there the principal claim urged for the first time for a reversal of the judgment was that there was no contract between the parties because at the bottom of the first page of the plaintiff's office stationery, upon which the proposal was written, appear the words:

"All agreements are contingent upon strikes, fires, accidents, or delays beyond our control. All prices are subject to change without notice, and all contracts and orders taken are subject to the approval of the executive office at Hyde Park, Mass.," and that, as there was no proof that this approval was given, there was no contract.

The court held that in view of the man-

ner in which this provision is printed upon the stationery of the plaintiff, it cannot be held, as a matter of law, that it was incorporated in and a part of the proposal. The language of the proposal is clear and explicit, and this provision, which is printed in small type, cannot be allowed to change, alter or modify it, unless it was part of the proposal. If, however, this point had been raised at the trial, it would have presented a question of fact to be determined by the jury.

When an offer, continued the opinion of the court, proposal or contract, continued the opinion of the court, is expressed in clear and explicit terms, matter printed in small type at the top or bottom of the office stationery of the writer, where it is not easily seen, which is not in the body of the instrument or referred to therein, is not necessarily to be considered as a part of such offer, proposal or contract.

Payment for Additional Radiation.

A contract to install a heating system in a house consisted of owner's acceptance of a proposal which provided for the installation of 325 sq. ft. of "three col. 38-in. radiators." In an action for a balance claimed to be due under the contract, the owner counterclaimed for the necessary expense of supplying 100 sq. ft. additional radiation subsequently found necessary to supply the requisite amount of heat. As the contractor did not warrant that the amount of radiation specified in the contract would be sufficient to satisfactorily heat the house, it was held that he was not required to furnish, without expense to the owner, the necessary additional radiation.—Miller vs. Winters, 144 N. Y. Supp. 351.

Draft Regulator for Furnaces.

In an action against an hotel for infringement of a patent for the regulation of furnaces the real defendant was the corporation which placed the alleged infringing apparatus in the hotel. The plaintiffs' patents were the McLean patents, No. 817,436, for mechanism, and No. 826,349, for a method for regulating furnaces to secure a "balanced draft" by which the blower and flue damper are automatically and reciprocally controlled by means of the steam from the boiler, with the object of maintaining atmospheric pressure in the furnace chamber. The combination which produces this result and the method of its production amount to a device by which as boiler pressure diminishes or increases the blower speeds up or slows down; if the blower slows, the flue damper correspondingly closes; if the blower speeds, the damper correspondingly opens. How much the damper shall move when the blower slows or hastens is empirically determined when the apparatus is put in place by observing the combustion chamber pressure under varying conditions of fire and air; but when the quantum of movement is determined, the power productive of motion is always the steam in the boiler, operating through machinery unnecessary to describe, directly on blower and flue damper.

To maintain "substantially atmospheric pressure" in the combustion chamber of a furnace (i. e., immediately above the fire bed) cannot, the federal district court, S. D., New York, said, be a desirable end—in and of itself. It must be indicative of more important things. The fact is that when the pressure is atmospheric, or substantially so, immediately above the furnace fire bed, there is no great suction of cold air into the furnace when the door is opened; nor, on the other hand, does a tongue of flame lick out into the fire room when opportunity offers. If the cold air does not enter above the fire bed, nor the flame shoot out, it is evidence that combustion is progressing with evenness, and the heated gases are progressing without undue speed through tubes and baffles toward the chimney exit where is situated the flue damper. Thus the maintenance of atmospheric pressure is merely a brief way of expressing the maintenance of favorable and economical conditions of combustion.

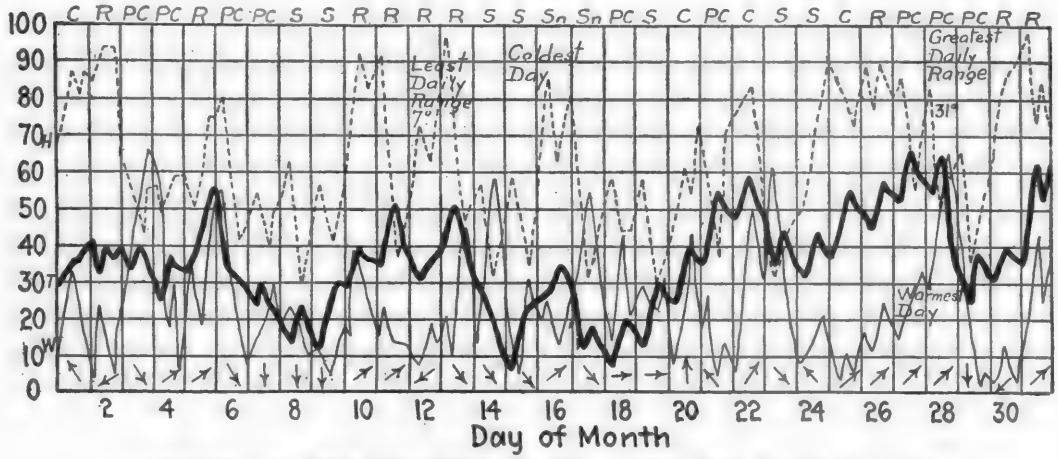
The district court held that the patents were not anticipated and were infringed, 226 Fed. 779. This was affirmed by the Circuit Court of Appeals on the opinion of District Judge Hough, the court also pointing out that the Peck British patent of 1893 came short of doing what McLean's patent did, namely, securing a range of variations which would operate efficiently under substantially all the varying rates of combusion which may call for control.—Engineer Co. vs. Hotel Astor, C. C. A. 226, Fed. 949.

Articles from Trade Papers Now Catalogued by the New York Public Library.

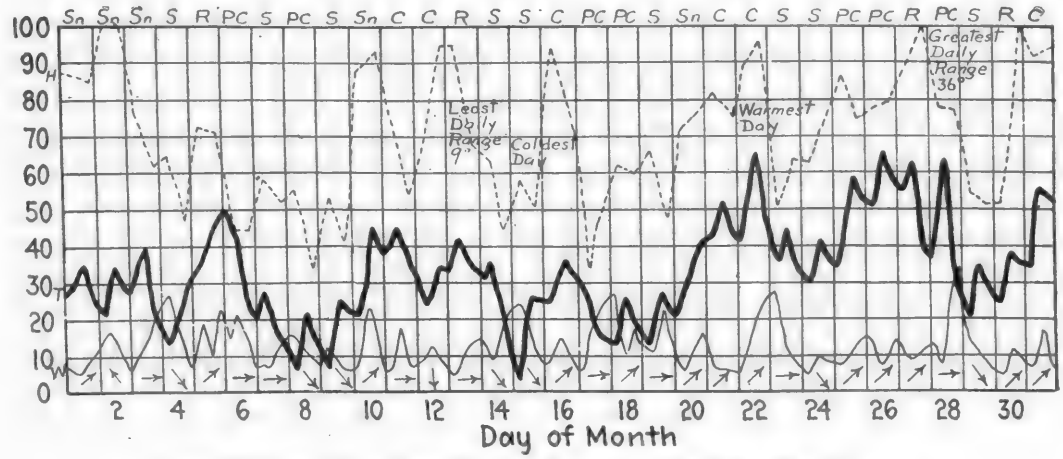
Announcement is made by the New York Public Library that the 200 periodicals on file at the library are all examined as soon as received and index cards for the most important articles are made and filed in the library's catalogue. The library states that it is also glad to lend current periodicals for a brief period. Among the periodicals taken by the library is THE HEATING AND VENTILATING MAGAZINE.

The Weather for January, 1916

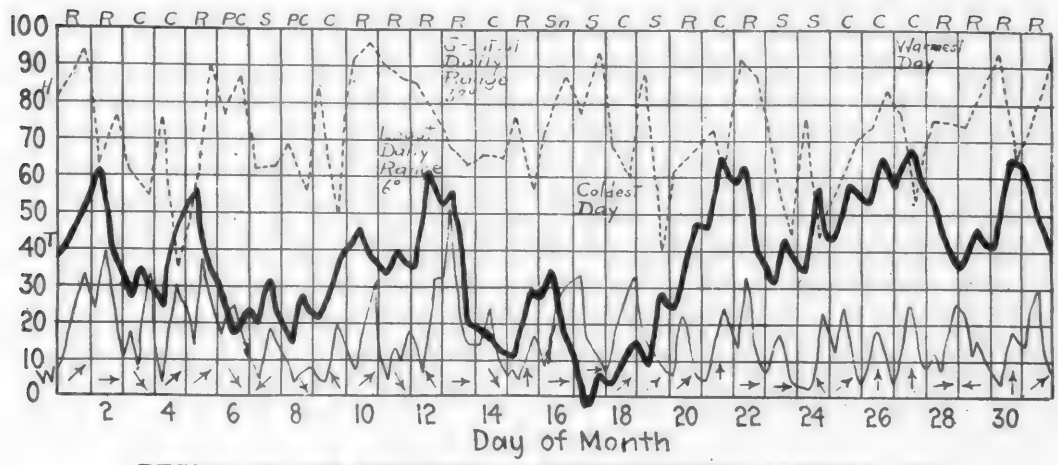
	New York	Boston	Pitts-burgh	Chicago	St. Louis
Highest temperature, degrees F	66	66	69	62	65
Date of highest temperature	27	22	27	27	1
Lowest temperature, degrees F	7	4	—3	—6	—4
Date of lowest temperature	15	15	7	13	13
Greatest daily range, degrees F	31	36	38	45	48
Date of greatest daily range	28	28	13	5	12
Least daily range, degrees F	7	9	6	5	6
Date of least daily range	12	13	11	18	30
Normal temperature for month, deg. F	35.4	33	38	28.8	34.1
Normal mean temp. for month, deg. F	30	27	30.7	23.7	31
Total rainfall, inches	1.08	1.23	3.51	4.84	8.53
Total snowfall, inches	0.7	4.7	1.3	2.7	2.7
Normal precipitation, this month, inches	3.79	3.82	2.87	2.0	2.27
Total wind movement, miles	15016	8755	9898	11551	12248
Average hourly wind velocity, miles	20	11.8	13.3	15.5	16.5
Prevailing direction of wind	S.W.	S.W.	S.W.	W.	S.
Number of clear days	7	9	6	10	8
Number of partly cloudy days	10	7	2	4	3
Number of cloudy days	14	15	28	17	20
Number of days on which rain fell	11	9	15	22	16
Number of days on which snow fell	2	5	1	4	4
Snow on ground at end of month, inches	—	—	—	—	—



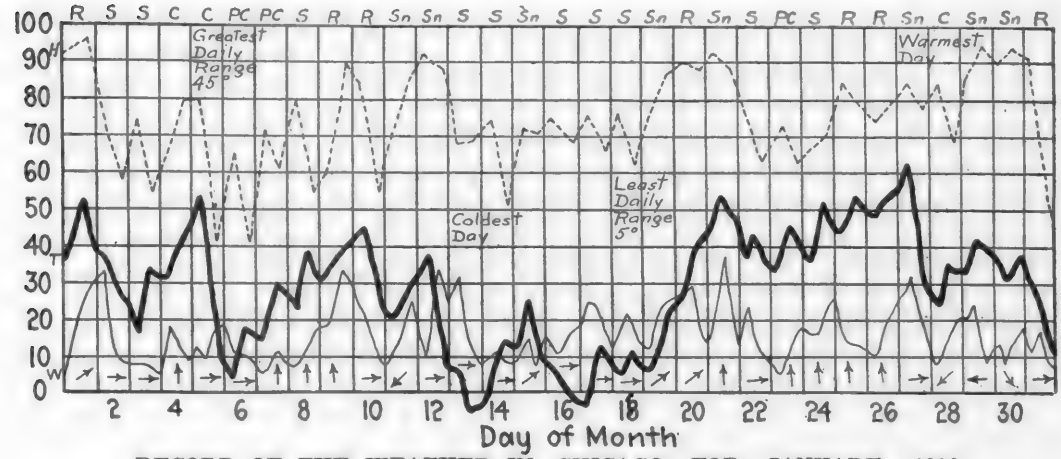
RECORD OF THE WEATHER IN NEW YORK FOR JANUARY, 1916.
Hourly Observations of the RelativeHumidity are Plotted on this Chart.)



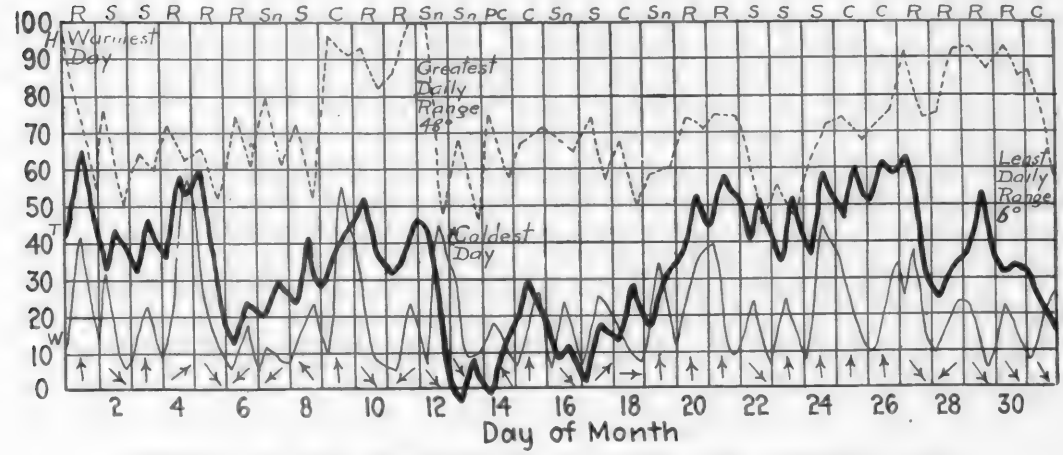
RECORD OF THE WEATHER IN BOSTON FOR JANUARY, 1916.



RECORD OF THE WEATHER IN PITTSBURGH FOR JANUARY, 1916.



RECORD OF THE WEATHER IN CHICAGO FOR JANUARY, 1916.



RECORD OF THE WEATHER IN ST. LOUIS FOR JANUARY, 1916.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.

Heavy lines indicate temperature in degrees F.

Light lines indicate wind in miles per hour.

Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.

S—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.

Arrows fly with prevailing direction of wind.

Testing Plant for International Boilers.

The many points to be covered in the testing of boilers are indicated in the accompanying views of the testing plant maintained by the International Heater Co., at Utica, N. Y. Fig. 1 represents a test in progress on a round boiler burning soft coal. The tester at the left is observing the gas analysis, while an engineer on the right is taking readings from a pyrometer. It is frequently necessary to take 21 different readings at 15-min. intervals for periods of from 9 to 48 hours.

The water used is, of course, all weighed In Fig. 2 may be seen a long gauge which extends the length of the tank. This gauge indicates the weight of water in pounds at any given point. Each tank is thus equipped. To guard against any undetected leakage through valves that might affect results, each pipe has double valves, A, A, with a small pet cock between. When both valves are closed and the pet cock opened, any leakage due to the tank or from the tank toward the boiler would be immediately detected.

Compressed air is used to force the water from the tanks into the boiler and the gauge, B, allows conditions to be adjusted so as to overcome the boiler pressure. As the temperature of the feed water is an important factor, a thermometer, C, always indicates that.

It would not be satisfactory to determine the steam pressure of a boiler being tested with the ordinary steam gauge. The pressure is registered on a mercury column, D, graduated to record pressures down to 1 oz. But while a gauge of that kind is accurate for steam pressures, it cannot be depended upon to register the draft pressure of a boiler or smoke flue. Therefore special instruments built for this purpose are used (E) which will record a pressure as low as 1/1000-in. of water. When it is stated that 1-in. of water represents a pressure of 3/5-oz., it will be seen how finely these instruments are adjusted.

A barometer and hygrometer, F and G, register atmospheric conditions which have to be reckoned with in making tests. The next instrument, H, is the pyrometer, connected with the four thermo couples which may be seen extending into the boiler. These couples are connected by insulated wiring through a 4-point switch to the pyrometer. The heat sets an electric current in action, which increases or decreases in force in exact ratio to the temperature. The sensitiveness of these instruments will be appreciated when it is stated that the heat of a match may be recorded with practically the same accuracy as the temperature of the fire in the boiler.

All the coal is weighed, as well as all ash and residue. The smoke and gases passing up the chimney are trapped into a flue gas sampling tank, I. At the close of the test, they are conducted to the gas analysis machine, K, to determine how

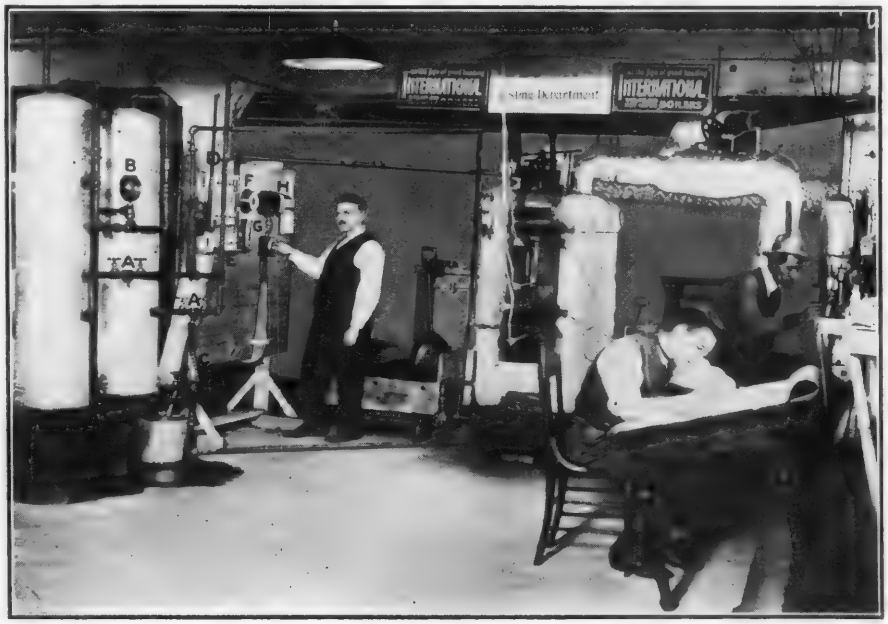


FIG. 1.—TEST IN PROGRESS ON ROUND BOILER BURNING SOFT COAL

much carbon dioxide, carbon monoxide, etc., are present. During the test, at intervals, the gases are also taken directly to the analysis machine and analyzed. An excess of carbon monoxide means that 1 lb. of coal will convert only 3 pints to 2 quarts of water into steam, while if the gases show a proper proportion of carbon dioxide, the amount of steam obtained by burning 1 lb. of coal may be from 1 to 1 1/5 gals. of water.

Still, another interesting instrument used is the recording thermometer, L, by which a record is obtained of the flue gas temperatures during the entire period of the test. The pipe passing through the window is the steam pipe. In order to be sure that only dry steam passes through it, a steam separator is placed at M (Fig. 3) in which the water is separated from the steam. If this were omitted and a boiler incorrectly designed, the tests might show a false result, since it is easy for the water to be picked up by the escaping steam and carried along with it. This may be the explanation of apparently high evaporative results sometimes secured in boiler tests.

Perfection heaters, made by the Perfection-Spring Service Co., Cleveland, O. This heater was illustrated and described in THE HEATING AND VENTILATING MAGAZINE for December, 1915. Exhaust gases from the engine are used for heating.

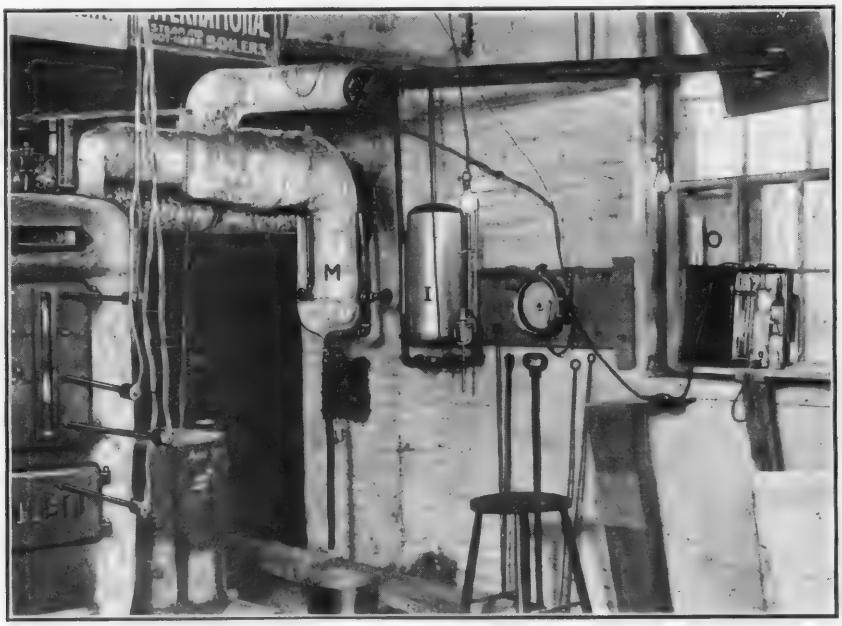


FIG. 2.—NEAR VIEW OF SEPARATOR, RECORDING THERMOMETER AND GAS ANALYSIS MACHINE.

Automobile 'Buses To Be Heated.

As a striking evidence of the growing public demand for comfortably-heated 'buses and taxicabs comes the announcement that the Fifth Avenue Bus Co., New York, has placed an order for 240 Type B

Ventilation of Chicago Schools.

Referring to an item published in the February issue to the effect that from ten to fifteen letters per week had been received by Dr. John Dill Robertson, from parents and teachers, complaining of the ventilation in the public schools of Chicago and that the letters were to form the basis of a special investigation by the engineering department of the Board of Education, attention is called by a correspondent to the fact that there are more than 275 school buildings in Chicago, averaging 16 rooms each, or nearly 4,500 rooms, and ten or fifteen complaints a week in as large a number of rooms should be considered very small, especially when it is considered that there is such a wide difference of opinion as to the proper method of ventilating school rooms.

The statement by itself, continues our correspondent, might lead unthinking people to jump to the conclusion that the Chicago schools are badly ventilated, which is not the case, as the system of ventilation in the Chicago schools is second to none in the United States. The correspondent's personal opinion is to the effect that if the ventilating systems are properly

operated there need be no actual complaints from improper ventilation.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New Secretary for the Heating Engineer's Society.

J. J. Blackmore, for two years secretary of The American Society of Heating and Ventilating Engineers, has tendered his resignation, to take effect April 1, 1916. Mr. Blackmore will be succeeded as secretary by C. W. Obert, at present assistant secretary of the American Society of Mechanical Engineers and formerly on the editorial staff of the *Engineering Record*.

During Mr. Blackmore's incumbency the society has made rapid strides forward and

C. W. OBERT.
New Secretary of The American Society of Heating and Ventilating Engineers.

in April last year commenced the publication of a society Journal which has done much to widen the interests of the membership in the work of the organization.

Mr. Blackmore will return to the commercial field, taking up the management of a new boiler and heater department at the J. L. Mott Iron Works, New York. The company's former boiler department, of which Mr. Blackmore was manager for many years, was taken over, it will be recalled, by the United States Radiator Corporation at the time of the organization of that company a few years ago. The new department will market the line of boilers and radiators previously manufactured by the Federal Radiator Company, which was organized to take over the line of boilers and radiators made by the Novelty Iron Works, of Canton, O. It is expeted that the J. L. Mott Iron Works will have its new product ready for the market by the first of June.

C. W. Obert, the new secretary, is known to many of the members. He has made an enviable record in connection with the editorial management of the Journal of the mechanical engineers' society. He had direct charge of the preparation of the publication of the boiler code recently promulgated by that society. This experience, coupled with his previous work for the *Engineering Record*, will go far towards insuring his success in the broadened field of activities which the society has entered. Mr. Obert will be at headquarters beginning April 1.

New York Chapter Takes Up the Problem of "Co-operation Among Engineers."

The neglected opportunities of the heating and ventilating engineer to further his interests and those of the profession, came in for some sharp comments at the February meeting of the New York Chapter, which took the form of a complimentary dinner in the rooms of the Building Trades Employers' Association, in New York, February 28. In the absence of President W. H. Driscoll, Vice-President Arthur Ritter occupied the chair. The speakers were W. M. Franklin, who is chairman of the committee in charge of the society's publicity campaign; Charles F. Hauss, of Milan, Italy, who is a charter member of the society but who has spent the last ten years abroad; and Frank K. Chew.

Mr. Franklin spoke first on the broad aspects of the subject, stating that the great European war has already taught us the necessity of developing our own resources to the point where we will be as little dependent as possible on Europe for either raw materials or finished products. He spoke particularly of the need of this country's manufacturing its own dyes and chemicals. In event of our being plunged into war, so that such imports were cut off, this country, he said, would be seriously embarrassed, if we were not able ourselves to turn out all the neces-

sities of life. Mr. Franklin said he saw protective legislation coming. Most of the country's present prosperity is due directly or indirectly to war orders and at the close of the war measures will have to be taken to avoid a business panic. We should adjust ourselves, therefore, to a perpetuation of the new industries created as a result of the war.

The engineering field, continued the speaker, has never been appreciated as it is to-day. Engineering is the greatest single element in our modern civilization. Engineering is fighting the war to-day and it is an engineering war. Moreover, the term of engineer is being so widely applied that it has come to include every trained worker.

The heating engineers are not availing themselves of the opportunity now presented to them of building up an effective and powerful organization. Effort is the price of accomplishment and every man has got to do something. If we are to take advantage of the influence the war is having upon our industries, we must put our shoulders to the wheel. We must get out to the meetings. We must disseminate knowledge of our art.

All of the large national engineering societies are recognized and are represented on the government's advisory board for military preparedness. But the heating and ventilating profession is not recognized in the make-up of this board. Yet the fundamental problem in the construction of submarines, for instance, is that of the ventilation and heating of such vessels.

Then there is a great wave of interest in sanitary matters and sanitarians are largely getting the credit for the advances in our field. The other engineering organizations do not do things that way. They go to the colleges and suggest lines of research.

By promoting the interests of the profession the engineer promotes his own individual interests and the way to start promoting is to get out to the meetings, to suggest lines of effort, to write papers and to start discussions.

Mr. Hauss, who followed Mr. Franklin, is the president of the American Chamber of Commerce in Milan. He said that in continental Europe everybody consults the engineer when there is work to do requiring such services. He said not one of the things that most impressed him on his return to the United States was the tremendous waste on every hand. Overheating, he declared, was one of the principal forms of waste and it was difficult at first for him to become accustomed to the high indoor temperatures.

He predicted a wide market in Europe after the war for American products. Many of the mines, he said, are already or will be destroyed, although in connection with agricultural and similar pursuits, he thought Europe would recover comparatively quickly. He expects to see the cancellation this year of many so-called war orders.

Speaking of the use of heating apparatus in Italy, he said the usual types could not be operated generally owing to the high cost of fuel. The price of bituminous coal in Milan, he said, was $42.00 per ton and that of anthracite coal, $50.00 per ton.

Frank K. Chew, who was then presented, emphasized the interesting character of the lectures and discussions that had marked the meetings of the New York Chapter and stated that the members were neglecting their own best interests when they missed them. He paid a high tribute to the retiring secretary of the society, J. J. Blackmore and amid applause, expressed the good wishes of the members that would go with Mr. Blackmore in his new field of work.

Mr. Blackmore, who was present, after expressing his thanks for the reception accorded him, stated that his two years' association with the members as Secretary had been an exceedingly pleasant one and that while he was leaving active work in the society, he would, of course, retain his membership and would continue to do what lay in his power to advance the society's interests.

New members were elected to the chapter as follows: A. E. Carpenter, A. K. Ohmes and D. R. Ludlow.

In response to a request from the chairman for suggested topics for discussion, the topics of "legal decisions," "ventilation of subways," and "contracts and guarantees" were suggested. It was voted to dispense with an annual dinner of the chapter this year, and instead to continue to have the chapter meetings in the form of dinners, the members to be the guests of the chapter.

Illinois Chapter Hears Lecture on Fire Prevention.

Fire prevention, with especial reference to the work of the Underwriters' Laboratories of Chicago, was the principal topic for discussion at the February meeting of the Illinois Chapter, held February 14 at the Morrison Hotel, Chicago. J. E. Latta, of the Underwriters' Laboratories, was the speaker and his remarks were illustrated by moving pictures which added greatly to the interest of the meeting. The work of

the laboratories, it was shown, includes experimental tests to determine the fire hazard in various kinds of building materials and the methods of making these tests were fully described by Mr. Latta. The experimental plant is valued at $250,000 and is a gift from the insurance companies to develop methods for reducing the fire hazard.

The lecture followed a dinner at the Hotel Morrison. Before the speaker was introduced the Illinois Chapter took formal action in extending an invitation to the American Society of Heating and Ventilating Engineers to hold its mid-summer meeting in Chicago. It was pointed out that it is ten years since the society came to Chicago.

President Harry M. Hart, of the society, announced that the meeting of the Chicago Commission on Ventilation, to be held February 22, would take up hospital ventilation.

The following were elected to membership in the chapter: John J. Haines, George H. Heinrich, John Howatt, George D. Hoffman and H. K. Gilson.

Massachusetts Chapter.

General topics pertinent to the trade were discussed at the February meeting of the Massachusetts Chapter, including reports from those in attendance at the society's annual meeting in New York in January. It was the consensus of opinion that the business outlook is brighter than for months past and that there were many good specifications for heating and ventilating installations recently completed.

Michigan Chapter Organized.

Starting with a membership of thirty-five, one of the best initial showings made by any chapter, the Michigan Chapter of The American Society of Heating and Ventilating Engineers was formally organized at the Detroit Club, Detroit, Mich., February 4. Officers were elected as follows:

President, Professor John R. Allen, of the University of Michigan, Ann Arbor; vice-president, Fred R. Still, American Blower Co., Detroit; treasurer, Edward M. Harrigan, of the Harrigan & Reid Co., Detroit, and secretary, William F. McDonald, heating engineer, Dime Bank Building, Detroit.

The Michigan Chapter's first regular meeting was held March 8.

The chapter has already laid plans to induce The American Society of Heating and Ventilating Engineers to hold its forthcoming semi-annual meeting in Detroit.

Ohio Chapter.

Temporary officers of the Ohio Chapter, which was recently organized, have been elected as follows: President, William M. Kingsbury; secretary, Frank G. Phegley; treasurer, F. H. Valentine. The headquarters of the chapter are in Cleveland.

NATIONAL DISTRICT HEATING ASSOCIATION

New Date for Annual Meeting.

Owing to the fact that the National Electric Light Association has selected the same week for its meeting as had been previously chosen by the National District Heating Association, a change has been made in the date for holding the district heating association's convention from May 22-25 to May 16-19, bringing it one week earlier. As already announced, New York will be the convention city this year, headquarters being at the Hotel Martinique.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Annual Convention of the Wisconsin Association.

A successful year of effort, accompanied by a 7% increase in membership, was reported at the fifth annual meeting of the Wisconsin State Association of Master Steam and Hot Water Fitters, held in Milwaukee, Wis., January 20. Many of the members are also affiliated with the Wisconsin Master Plumbers' Association, which was in session in the same city.

In further reviewing the work of the year, President Edward Grassler mentioned the accomplishments of the National Association in completing the standardization of flanges and flanged fittings, and in rendering service to its members in educational and legislative matters. The report of the secretary showed an increased balance on hand.

The following officers were elected: President, James Schmollen, Racine; vice-president, Albert Luebke, Milwaukee; treasurer, Fred Kauffman, Milwaukee; sergeant-at-arms, Otto Biefeld, Watertown; secretary, Frank H. Meadows, Milwaukee.

Following the convention an association banquet was given the members and guests at the Republican House. The speakers

included Mayor Bading, of Milwaukee; Judge J. E. Karel, and Attorney William Zimmer. Two surprise presentations were features of the banquet, one being in the form of a gold watch, given to Albert Luebke, former president of the Milwaukee local association, and the other, an automobile luncheon case, presented to Fred Kauffman, the newly-elected treasurer. Over 100 guests were in attendance.

The association is planning to hold a midsummer convention in Fond du Lac some time in July.

Central Supply Association.

At the seventieth regular meeting of the Central Supply Association in Chicago, February 23, a report by Secretary Paul Blatchford, on the cost of doing business during 1915, covering over 30 jobbing points, showed the average cost to be 15.77%. A summary of the advances in supplies, material and fixtures was also presented. In the afternoon an address was delivered by Philip S. Post, general counsel of the International Harvester Company, dealing with the present chaotic conditions of licenses, taxes and requirements for doing business by foreign corporations in the various States, and concluding with an analysis of the Federal Trade Commission Act and the Clayton Law.

Institution of Heating and Ventilating Engineers.

The annual meeting of the (British) Insitution of Heating and Ventilating Engineers was held March 8, at the Holborn Restaurant. A paper was presented by A. H. Barker, B. A., B. Sc., and M. Kinoshita on "Experiment in the Flow of Air Up a Hot Flue." The new president of the institution, Sam Naylor, made his address, which was followed by committee reports and other business.

Class Dinner of the New York School of Heating and Ventilating.

Arrangements have been made for holding a class dinner of the New York School of Heating and Ventilating, which has been meeting Monday evenings in the World Building, under the direction of Charles A. Fuller. The dinner, which is coming to be an annual event, will be conducted this year by the alumni of the class. It will be held March 13 at Stewart's Restaurant, 30 Park Place, the committee on arrangements being A. D. Sage and A. D. Hoxie. Tickets will be $2.

Features of the Farnsworth Line of Heating Specialties.

A comprehensive idea of the different uses of the Farnsworth line of steam specialties may be gained from the accompanying typical installation, showing the front half of a power boiler and several kinds of Farnsworth apparatus, connected to handle condensation and make-up water correctly under the varying conditions involved in the average power and heating plant; eliminating the use of pumps, receiving tanks and their several auxiliaries, as well as lubricating oils and packing.

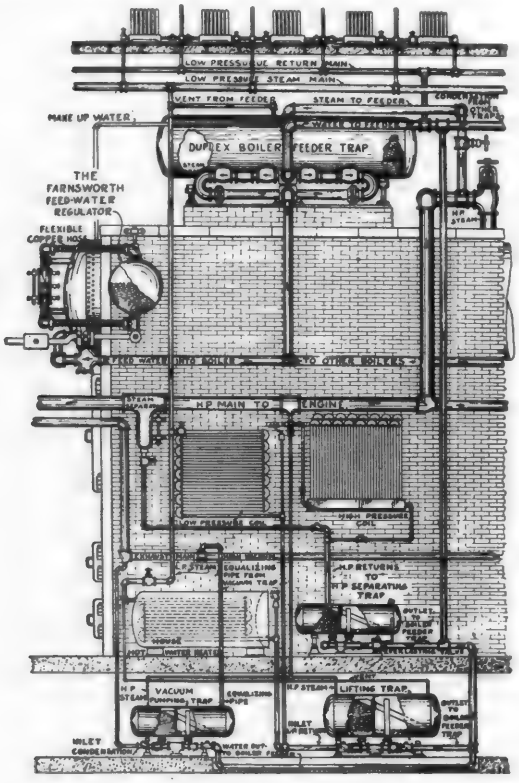
The Farnsworth duplex boiler feed trap, the principal apparatus used, is shown on top of the boiler and not only feeds all the condensation coming back from the heating system, and the several traps, but also feeds the cold water make-up into the boiler automatically, eliminating boiler feed pump injectors, or any other of the usual processes. The advantage of this trap, it is pointed out, is that it is absolutely automatic and is a receiving tank as well. Another point made in its favor is that it does not require as much steam as a pump, for the reason that 1 cu. ft. of steam displaces 1 cu. ft. of water, while with the steam pump the steam cylinder is usually twice the size of the water cylinder, and there is also the friction and head on the feed line between the pump and the boiler.

The tank is divided into two chambers, one chamber being always open to receive condensation, while the other is under pressure feeding the water into the boiler.

It will be noted that all condensation from radiators or heated apparatus that are above the water line of the boiler feeds directly into the boiler feed trap, while the condensation from the heated apparatus, etc., below the water line of the boiler, has a special trap for each condition. The condensation from the steam separator and the high pressure coils drains into a high pressure separating trap, and its contents are discharged up into the boiler feed trap. The condensation from the low pressure coils and from the coils in the hot water heating tank, or tanks, requires a lifting trap. The condensation flows into the lifting trap and by the attachment of a high pressure steam connection, when the lifting trap tilts down when full of water, it opens the high pressure steam and closes the vent and pumps the water up into the boiler feed trap. As the contents from the lifting trap are discharged, the tank re-oscillates, closing the high pressure steam valve and opening the vent valve. Then

the trap again receives low pressure condensation.

The same lifting trap can be used as a vacuum pumping trap for draining condensation from lines carrying a high vacuum. When the trap is filled, it tilts down, closing the equalizing pipe and opening the high pressure steam valve, which pumps the condensation up into the boiler feed trap. As the trap is emptied and re-oscillates, the equalizing valves open and the high pressure valve closes, and then



TYPICAL HEATING INSTALLATION SHOWING USE AND LOCATION OF FARNSWORTH SPECIALTIES.

the trap begins to fill with condensation again.

The piping connections and other features, it should be stated, are not drawn to scale.

The Farnsworth system is made up of devices all bearing the name of Farnsworth and manufactured by the F. C. Farnsworth Co., New York. One of the principal features mentioned in favor of this system is that it retains the heat units in the condensation by the closed system method. The pressure of the condensation from high pressure steam mains is not allowed to lower so that the only heat units lost are those required in the heated apparatus and those lost in the pipe lines.

In addition to the conditions stated above, if there is condensation under high or low vacuum to be taken care of, the Farnsworth vacuum trap is designed to collect, and with high pressure steam connection, to pump such condensation into the boiler feed trap. Also a meter trap will indicate how much steam is required to heat any heated apparatus and will also pump the condensation back to the boiler feeder. In addition, the Duplex boiler feed trap will collect condensation from low pressure heating systems where vacuum return line valves are used on each radiator. In that case, the condensation and air is all fed into the boiler feeder. Then the air is separated off to the sewer and the condensation is fed into the boiler, eliminating the vacuum pump.

Consolidated Engineering Company Branches Out As Manufacturer of Fans and Blowers.

All the land, buildings, tools, machinery and equipment formerly owned by the Massachusetts Fan Company, Watertown, Mass., a suburb of Boston, has been purchased by the Consolidated Engineering Company of Chicago, which has commenced the manufacture of fans, blowers, and heater equipment, as formerly made by the Massachusetts Fan Company.

John E. Anderson, for the past 24 years a ventilating engineer and for the past seven years with the B. F. Sturtevant Co., Chicago office, has been appointed sales manager in charge of the Massachusetts blower department and the Kinealy air washer.

The manufacture of the Kinealy air washers will be transferred from the Chicago factory to the Watertown plant, and complete blower equipment and air conditioning apparatus will be built at the Watertown plant in the future.

The Consolidated Engineering Company is building a new factory in Chicago at 28th Place and Shields Avenue, which will more than double the capacity of its present factory at Jackson and Canal Streets. The manufacture of vacuum valves and heating specialties such as pressure reducing valves, pump governors and steam traps, will be carried on at the Chicago factory, while some of the heavier apparatus will be built at the Watertown plant.

The acquisition of the Massachusetts Fan Company places the Consolidated Engineering Company in the unique position of being the only manufacturer in the vac-

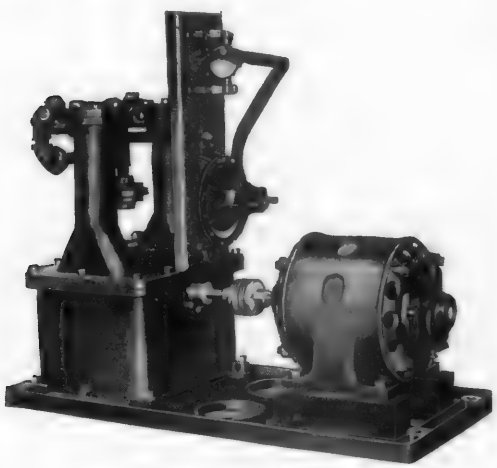
uum heating field that manufactures everything required in the heating and ventilating of a building, with the exception of the boiler, pipe and fittings. The company's line now includes the Van Auken system of vacuum heating, Van Auken steam heating specialties, Thermograde modulation system of heating, Kinealy air washers and Massachusetts blowers.

NEW DEVICES

Powers Electric Motor-Driven Vacuum Pump.

To supply the demand for a high-class electric motor-driven vacuum pump for air line steam heating systems a new design has been brought out by The Powers Regulator Co., Chicago, Ill., which is described as direct-connected, noiseless, automatic and efficient. It will be noted that the pump and motor are both mounted on one base, direct-connected with a flexible coupling. The apparatus may be placed on a foundation or on wall brackets, as preferred, while the controller may be mounted on the pump, as shown, or separately. The worm and gear are of hardened steel and run under oil in the crank case. Automatic lubrication is provided, including that for the pistons.

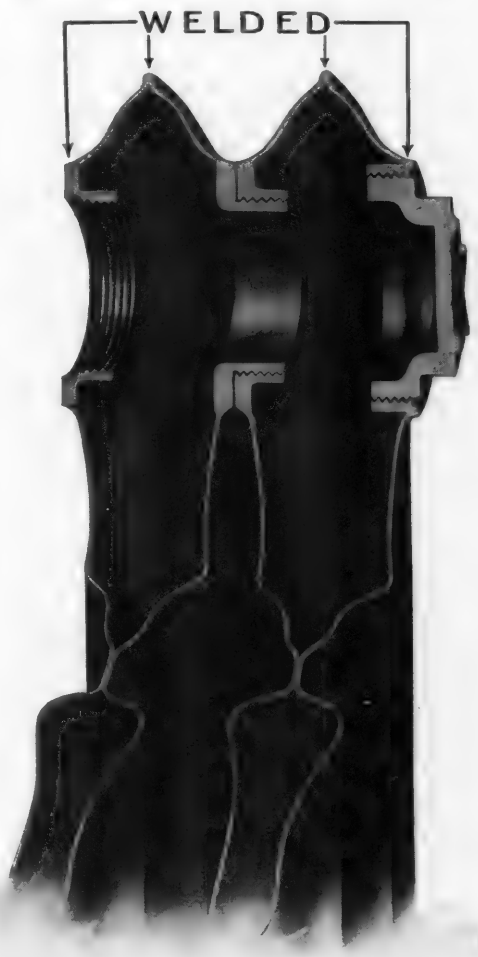
The controller used with this pump, consisting of pneumatic governor and switch, has been standard with the company for years. It is designed to operate on a vacuum variation of 4 in. Further details of construction are contained in the company's Bulletin 135.



NEW TYPE OF VACUUM PUMP.

The New Pressweld Sheet Metal Radiator.

The accompanying view shows the construction of the new Pressweld "alloy" sheet metal radiator, which, as announced last month, has been placed on the market by the American Pressweld Radiator Cor-



CONSTRUCTION OF PRESSWELD SHEET METAL RADIATOR.

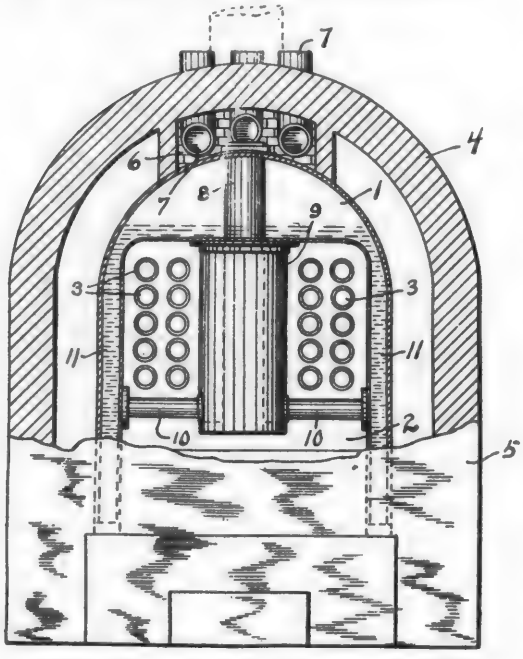
poration, Detroit, Mich. This radiator is made up of uniform sections, each section consisting of two plates of heavy gauge radio alloy sheet metal, made especially for this purpose, stamped out by presses and then united by a special welding process. The sections are joined with a special right-hand nipple top and bottom. This, it is stated, is one of the valuable features of this radiator, making it possible to easily add sections or to reduce the number of units at any time. The quickness with which the Pressweld radiator heats and cools, due to its thin surfaces and their

lightness in weight, are also emphasized. In a recently-completed building, for instance, the aggregate weight of cast-iron radiators is 400 tons, while the use of the Pressweld type will reduce the weight to 100 tons.

Following are the officers of the company: President, Martin F. Millard; vice-president, Ernest Snell; treasurer, Ralph P. Peckham; secretary, John A. Irwin; general manager and engineer, Frank J. Singer; assistant manager, D. P. Murphy; superintendent, George W. Curtis.

New Patented Combustion System.

A recent patent, granted to Michael J. Carney of Kewanee, Ill., relating to a system of combustion applicable to any boiler or furnace for industrial or domestic purposes, discloses an interesting type of down-draft design. The feature of the device is a system of introducing all or part of the air necessary for combustion, depending on the nature of the fuel, directly over the fuel bed, and of preheating and expanding this air supply with waste heat from the flue gases by passing it through ducts in the flue gas passages whence it is led through the steam and water spaces of the boiler into the furnace.



NEW SYSTEM OF COMBUSTION FOR BOILERS OF FURNACES.

The rarer air, it is claimed, is thus conditioned to promote an intimate and thorough intermingling of the combustible gases with the supporter of combustion, at the moment of their distillation from the fuel, as this is considered necessary for efficient combustion. The theory is advanced that air directed downward over the burning fuel tends to hinder, by the direction of its flow, incompletely consumed gases from passing prematurely out of the incandescent and flaming zone of the fire, incidentally supplying a surplus of oxygen to complete the process of burning.

Figures from a test of eight hours showed an efficiency of 68.28 per cent., assuming dry steam, but corrected for moisture in the coal, with a load of ⅞ rated capacity of boiler, using Eastern test coal. With air supplied both over and under the fire the test revealed exceptionally easy steaming qualities for the boiler and good regulation.

An effort was made to approximate good working conditions rather than extraordinary test conditions to show average results for the system without special efforts and constant attention.

This system is based on a well-known axiom of combustion which has been a prolific source of experimentation among inventors and combustion experts in recent years, resulting on the whole, however, in a remarkable dearth of practical schemes for the reduction of the valuable principles involved to a workable basis.

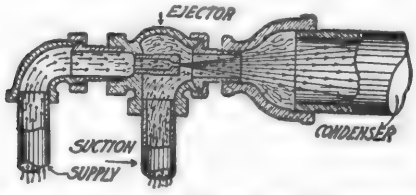
Some of the results so far demonstrated are a high efficiency at every phase of the variable loading under ordinary working conditions, ease of control, increased steaming capacity and a more smokeless combustion for boilers equipped with the system.

Trade Literature.

KERNER BUILT-IN-THE-CHIMNEY INCINERATOR is the subject of a newly-issued folder describing this equipment, which is manufactured by the Kerner Incinerator Co., Milwaukee, Wis. It consists of a patented arrangement of grates built into and forming a part of the regular chimney (usually the kitchen chimney) in which is consumed by burning all household refuse, including garbage. The refuse and garbage reaches the incinerating chamber through a hopper door in the kitchen or in the other rooms above. The feature of the system is the by-pass grate and the by-pass flue, which permit a free circulation of air. In this way combustion is induced from the top downward so that the odorous gases are consumed.

MOLINE HEAT EVERYWHERE is the title of a new general catalogue published by Moline Heat, Moline, Ill., in which the

Moline system of heating is discussed in a clear and unusually readable manner. The catalogue is handsomely prepared and bespeaks to a degree the confidence of the manufacturers in the merits of this system. After presenting in chronological order the methods used during the evolution of heating, a description is presented of hot air furnace heating, ordinary steam heating, hot water heating and, finally, of vapor or vacuum heating. Under "Essentials of Good Heating," are taken up the matters of separate regulation for each room, noiseless operation, and the use of packless rad-



CONSTRUCTION OF MOLINE EJECTOR.

iator inlet valves. Regulation is also discussed and the conclusion reached that Moline heat fulfills every requirement.

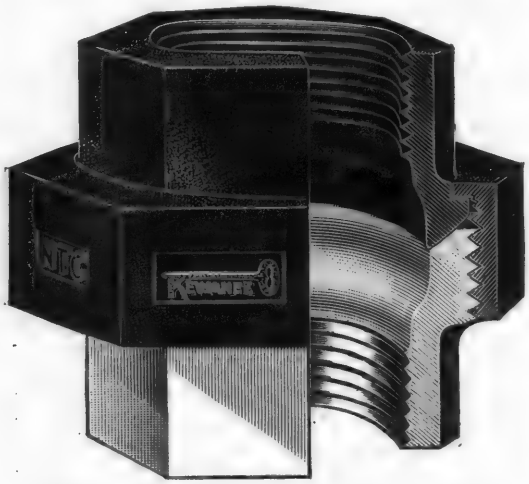
The various devices used with this system are then described, including the Moline ejector, Moline, condenser, Moline air relief valve, and Moline vacuum valve. The reader is given an explanation of their operation from the time the fire is started. The supply valves have a patented restrictor sleeve in the form of a round cylinder, provided with vertical slots. As the valve opens the slots become uncovered, admitting the vapor. The ejector and condenser arrangement for the removal of air is set at the end of the supply pipe and is attached also to the return pipes. This arrangement keeps the ends of the main supply pipes open to the atmosphere so that only a slight pressure at the boiler causes the air to flow out of the radiators and piping. The fire is regulated by the Moline sensitive damper regulator, the construction of which is also illustrated and described, as are also the Moline seals for separating the water of condensation from the steam and returning the condensation to the boilers, when necessary, under pressure. Special attention is called to the company's service department, which is prepared to furnish plans and specifications for the installation of Moline heat. The company guarantees plans and specifications bearing the Moline heat seal. Size 8½x11 in. Pp. 48. Separate catalogues published by the same company treat of "Moline Heat as Applied to Combined Heating and Ventilating Plants," "Moline Heat for Large Buildings, Factories, Etc., Using Live or Exhaust Steam" and "Moline Heat for Central Station or Municipal Heating Plants."

Bi-Calky Fans and Blowers, featuring the Bi-Multi fan wheels, is the subject of a new circular issued by the Bicalky Fan Co., Buffalo, N. Y. These fan wheels, it is stated, are built exceptionally strong and are guaranteed to stand up and not rack under the heaviest work to which fans are subjected. The circular includes capacity tables for ducts 200 ft. long and with a maximum velocity in the duct of 1,800 ft. per minute. These tables were compiled after numerous tests on various-sized fans and the company states that they may be relied upon. They show remarkable efficiencies. There is also included a price list for full-housed and ⅞-housed Bi-Multi fans. The company is also the manufacturer of the Bicalky planing mill exhauster, Bicalky propeller fan and the Bicalky roof fan ventilator, which are also mentioned and illustrated in the circular. Size 3¼x 6¼ in. Pp. 10.

Centrifugal Pumps for all purposes, including condenser circulation, general mill and power plant service, for motor, engine or belt drive, are now being built by the Wheeler Condenser & Engineering Co., Cartaret, N. J., and are described in the company's new bulletin, No. 108-A. These pumps are of the single-stage, double-suction, split-casing type, for heads from 0 to 300 ft. Special attention is called to the testing facilities in the Wheeler hydraulic laboratory and a short description of foundry methods is given. Among the designs of pumps shown, several are of particular interest, such as a combined motor and geared turbine-driven centrifugal pump, and a typical complete surface condenser auxiliary, with geared circulating pump direct-connected to a turbo air and condensate pump driven from a common turbine. Size 6x9 in. Pp. 34.

Valve World for February, 1916, the monthly periodical of Crane Co., Chicago, Ill., continues the "Non-Technical Chats on Iron and Steel and Their Applications to Modern Industry," by L. W. Spring, the company's chief chemist and metallurgist, this month's installment taking up the discussion from making of pig iron in the blast furnace. The article is devoted mainly to a description of the metallographic method of classification and classification by chemical analysis and physical tests.

THE WHOLE "KEWANEE" FAMILY, embracing all Kewanee specialties manufactured at the Kewanee Works of the National Tube Co., Pittsburgh, Pa., is the subject of a comprehensive catalogue giving detailed information regarding this line. The catalogue opens with a "little history," telling how the idea developed of making a union with a brass-to-iron thread connection, to take the place of a flange union. It was well-known that an iron-to-iron thread connection would ultimately rust together, but the brass-to-iron thread connection will not rust together, and can be disconnected and reconnected



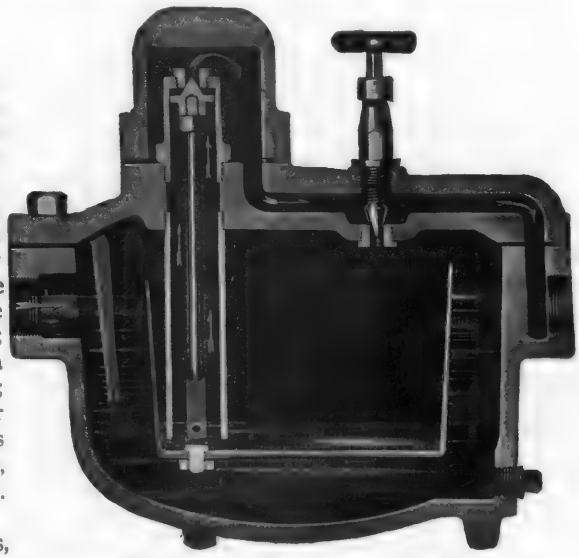
KEWANEE UNION, OCTAGON PATTERN.

almost indefinitely. This, in brief, is the principal feature of the Kewanee union, although other features are that it has no inserted parts, while each separate union is subjected to a compressed air test under water. The union has but three parts, a heavy ring of malleable iron, a bottom of malleable iron and a heavy thread end of high-grade brass. It is made in the octagon pattern, so that it may be applied with an ordinary monkey wrench; the regular round end pattern, the extra heavy pattern, designed for high pressures; and the hydraulic pattern, designed for very heavy pressures. The catalogue goes into details, with numerous illustrations, covering each type. Size 5¼x8 in. Pp. 72.

STURTEVANT TURBO-UNDERGRATE BLOWERS, with which the steam output may be increased at a fraction of the cost of a new boiler, are brought to the attention of the trade in a new bulletin issued by the B. F. Sturtevant Co., Hyde Park, Mass. Among the advantages gained by using the Sturtevant turbo-undergrate blower are mentioned the attainment of 110 to 200% more horse-power without adding more boilers, the ability to burn cheaper fuel, such as screenings, culm or coke breeze; and greater furnace draft at any time to meet special calls or peak loads for power. These blowers are built in four sizes with 14-in., 18-in., 22-in. and 26-in. diameter fans. The bulletin contains a list of a number of firms which are using this apparatus. The bulletin is No. 1022.

QUINCY MARKET AMMONIA COMPRESSOR SAFETY VALVE, a device approved by the Board of Boiler Rules, Commonwealth of Massachusetts, as complying fully with the provisions of the State law relating to ammonia compressors, is described in a bulletin issued by the Star Brass Mfg. Co., Boston, Mass., which also quotes the law in full on the subject. The circular also features the Quincy Market ammonia relief valve and the approved Quincy Market diffuser, for preventing the discharge of an undiluted column of ammonia gas into the atmosphere through a pipe other than a ventilating stack.

KIELEY "EASY REPAIR" STEAM TRAP is featured in newly-issued circular matter published by the manufacturers, Kieley & Mueller, Inc., New York. The important advantage mentioned for this trap is that all the working parts, as well as the cover,

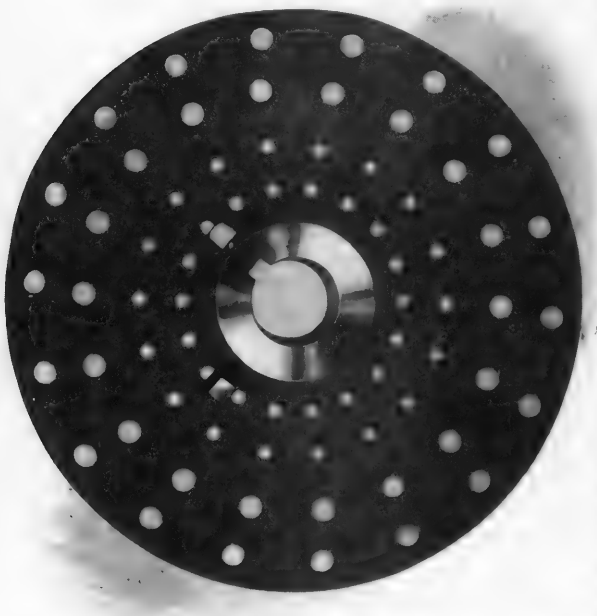


KIELEY "EASY REPAIR" STEAM TRAP.

can be removed without breaking any pipe connection due to the fact that all connections are in the body. The only parts liable to wear, it is stated, are the adjustable seat and the seat. By unscrewing two

nuts and removing the cap enclosing seat and disc, both are exposed and may be readily removed and renewed. One type of this trap is equipped with a water gauge. The company takes occasion to inform the trade and the public that "the genuine Kieley specialties are manufactured by ourselves and can only be secured through us or our branch houses or sales representatives."

SWEEPING IMPROVEMENT IN EXHAUST FANS is the title of a circular containing a reprint from the St. Louis *Lumberman* describing "an improved spider for blower fans," the reference being to the Bayley "B" planing mill exhaust fan, made by the Bayley Mfg. Co., Milwaukee, Wis. This type, it is shown, has a maximum of structural strength without metal overweighting, and, at the same time, the design permits of repairs with ease and convenience. In greater detail the features which distinguish the new blast wheel are that there is no cast-iron used in its construction; the arms are not cast into the hub; instead of a one-piece spider the wheel is of the built-up type; a central disc is used, a steel casting, machined all over, drilled for arms and carefully balanced; floats cut by template from No. 7 U. S. Gauge metal and of uniform weight; arms are two angles, hot riveted to central disc and spread at float end to support the inlet side of the



SHOWING A CENTRAL DISC OF BAYLEY WHEEL READY TO RECEIVE THE FLOATS

BAYLEY "B" WHEEL COMPLETELY ASSEMBLED.

float, thus shortening the overhang of the floats and strengthening them. The backs of the floats are supported by a back-shoot of heavy gauge metal. By this method each float is firmly riveted to its supporting arms. The blast wheel is of the multiblade type and its 18 blades are curved forward to accelerate the flow of air and increase the suction when running at a low peripheral speed.

KING RICHON (K. R.) HOT WATER HEATING SYSTEM, described as having all the advantages of low or high pressure or vacuum steam systems, as well as those of hot water systems, is the subject of a circular (Bulletin 41-A) published by the King Construction Co., North Tonawanda, N. Y. The striking feature of this system is that in a steam boiler carrying steam, the water from the boiler is circulated through the heating pipes instead of the steam. This inversion of the usual practice, it is stated, has solved many heating difficulties. The circulating water can be carried at any temperature from cold to 300° F. or more, thus covering the whole temperature range of ordinary hot water or low or high pressure steam systems. The water is circulated by a pump and in case of a breakdown a steam connection from the top of the boiler enables the system to be instantly changed to steam, the expansion of the water being taken care of by the steam space in the

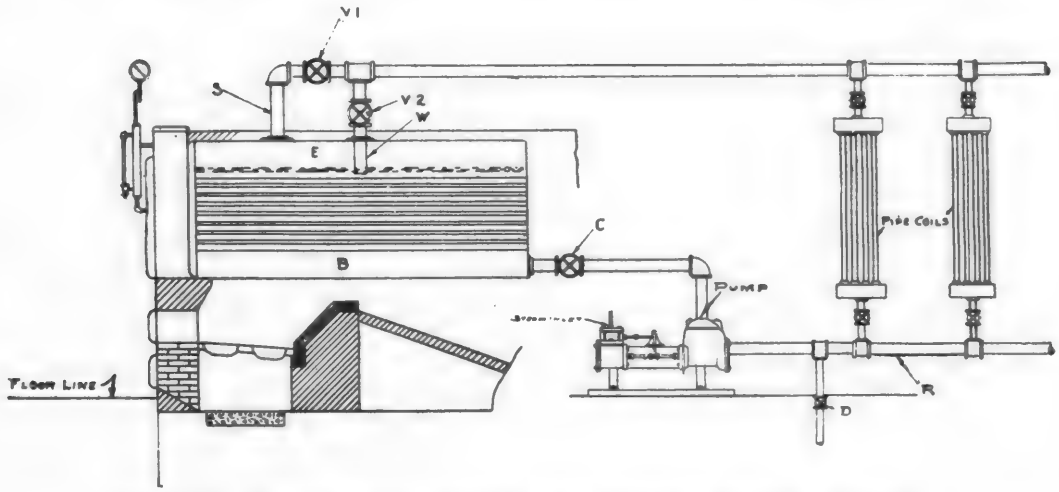


DIAGRAM OF THE KING RICHON HOT WATER HEATING SYSTEM.

boiler. With this arrangement, the same amount of piping is installed as would be used for steam. Also no expansion tank is required. The system, it is stated, is especially useful for greenhouse heating work. In the typical diagram shown herewith steam is taken through the opening S, while water is taken through the tube W. The return R from the heating system leads to the pump P, which discharges through the check valve C into the boiler. The return is also provided with a valve D, which can be opened to the atmosphere. In operating the system with water, the valve v1 on the steam opening is closed and the valve v2 opened. The system is filled with water except the space E, which cannot fill on account of the confined air. The pump P being started will draw water from the piping and force it into the boiler through the check valve C. This water will rise through the tube W into the main supply and thence through the system back to the pump. As the water in the system is raised in temperature, it will expand and partially fill space E. Ordinarily the volume of the space E is about four times the amount of the expansion of the water. Should anything happen to stop the pump, the system is instantly turned to steam by opening the valve v1 and closing v2, and opening the valve D in the return pipe R. The steam drives the water out of the system through valve D, which is afterwards partly closed, so as to allow only the water of condensation from the steam to pass out. This water, of course, can be returned directly to the boiler with a suitable pump or trap. A steam pump is generally used for circulating the water, the steam for driving the pump being furnished by a small auxiliary boiler. The exhaust steam from the pump is used for heating and with this design it is figured that the cost of pumping for a season, even on a large installation, is about the equivalent of three tons of coal.

New Books.

THE VENTILATION HAND BOOK, by Charles L. Hubbard, is the title of a new book in the form of a series of questions, answers and descriptions, covering the principles and practices of ventilation as applied to warm air furnace heating; ducts, flues and dampers for gravity heating; and fans and fan work for ventilation and hot blast heating. The scope of the book includes toilets and chemical hoods, the design of air filters and washers and ventilation of various types of buildings.

The matter is well arranged in readable style and is written especially for the beginner. In connection with the fundamental requirements for good ventilation no evidence appears in the book of the recent thought on this subject and the familiar "standard of air purity," based simply on the carbonic acid proportion is again presented. Exception will be taken in some quarters to the statement of the effect of gas jets and lamps upon the ventilation of the room, recent investigations having indicated that there are beneficial effects due to the circulation of the air by the jets that may counterbalance many of the deleterious effects. The author states that by the use of a water pan placed inside the casing of a warm air furnace, the warm air passing over the pan "takes up a suf-

ficient amount of moisture to give it the desired quality for proper ventilation." This is true, provided the water pan is placed at the proper point in the furnace, that is, above the dome, but with the usual form of construction, where it is located about on a level with the fire pot, it is well known, and perhaps the most serious handicap the warm air furnace is suffering from today, that the amount of moisture obtained will be far from sufficient.

The book has some 137 illustrations and has many valuable practical suggestions regarding installation details. The points raised by the questions are clearly answered, the drawings helping largely to make the explanations clear. Size 5½x8¼ in. Pp. 218. Published by the Sheet Metal Publication Co., New York, and may be had through the book department of the HEATING AND VENTILATING MAGAZINE Co. Price, $2.00 net.

A Handy Hot Water Tank Calculator for the Asking.

Announcement is made by the Power Regulator Co., 5 South Wabash Avenue, Chicago, Ill., that copies of the celluloid hot water tank calculator, which was recently gotten up by this company, will be sent free to any of our readers who are actually engaged in the engineering, architectural or contracting business. As described in the February issue, the calculator may be used for figuring the amount of coil surface in iron pipe and in brass pipe, as well as the pounds of condensation per hour. The calculator is in the form of two discs, one superimposed on the other. By moving the upper disc until the various quantities register, the result may be read directly from the calculator.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CHURCHES—

The Heating and Ventilating of Churches. Harold L. Alt. Ills. 3500 w. Bkbld—Dec., 1915. Practical systems and their installation. 60c.

VENTILATION—

Ozone for Ventilation. Ills. 2500 w. M & C E—Dec. 15, 1915. Report of test of Westinghouse air ozonizer, with experiments by Sheppard T. Powell. 20c.

THE BUSINESS OUTLOOK.

IV.

By FRANK M. HUSTON,

Financial Editor of the Chicago Evening Post; Editor Rand-McNally Bankers' Monthly.

General business is responding to the strong financial conditions in this country in a way that is reassuring. Bank clearings, since the beginning of the year have established a new high record, while business defaults for the first month of the year show a decrease in number of 25% compared with a year ago and in liabilities, which aggregate only about one-third what they were in 1915. All indications favor a further improvement in the business situation, a decline in commercial mortality and a lessened volume of liabilities.

Furthermore, there has been an increase in bank deposits all over the country that bespeaks a further expansion of business, and an increase in the credit available as a purchasing power. The effect of the enormous influx of gold, together with the exceedingy profitable business which Europe is doing with this country is being reflected in all lines of trade. Whereas a few months ago our prosperity was rather spotted, today it is broadening out and becoming more general.

The chief danger in the situation, however, is that our expansion in business may result in an inflation that ultimately must be followed by a reaction and depression. It is for this reason that bankers are admonishing business men generally to proceed with less insistence in expanding their business and to get back on a more normal basis so far as their borrowings are concerned. In other words, bankers and those who study business conditions closely are desirous that business men keep their affairs in as liquid a condition as it is possible to do and in this way they will be able to sustain prosperity through the period of readjustment that inevitably must follow the war.

From all sections of the country come advices of a heavy distributing of merchandise of various kinds, reflecting the increased demand, resulting from expanding purchasing power of the country at large. Retail dealers, mail order houses, as well as jobbers of various kinds, are active in making purchases for immediate requirements and for future delivery. Collections are exceedingly good, which is a further reflection of an improved business condition.

Among the railroads there is an evidence of prosperity that has not been experienced in many years. There is no industry in this

country that is as basic in its character, with the possible exception of steel making, as is the transportation business. Railroad earnings are showing monthly increases over a year ago both in gross and net, which is a healthy condition.

Capital in this country is accumulating exceedingly rapidly and naturally with this accumulation there is a corresponding increase in the demand for labor and for the products of labor.

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Expansion of Pipe Coils and Length of Spring Pieces.

The elongation of steam or hot water pipe coils and the length of their spring pieces is given in the following table. Coils over 200 ft. in length should have, if possible, a spring piece at each end, with an anchor in the center. The difference in tmperature ranges for steam coils from 52° to 232° F. For hot water coils the range is from 50° to 200° F.

EXPANSION OF COILS AND LENGTH OF SPRING PIECES.

Length of coil. Feet.	Elongation steam differ. in temp. 52°-232° F. Inches.	Length of shortest piece of spring piece. Ft. & in.	Elongation water differ. in temp. 50°-200° F. Inches.	Length of shortest piece of spring piece. Ft. & in.
10	9-64	1.6	⅛	1.6
20	9-32	1.6	¼	1.6
30	7-16	2.0	⅜	2.0
40	9-16	2.0	½	2.0
50	¾	3.0	⅝	2.0
60	⅞	3.0	¾	3.0
70	1	4.0	⅞	3.0
80	1 3-16	4.0	1	4.0
100	1½	5.0	1 3-16	4.0
120	1¾	6.0	1½	5.0
140	2	7.0	1¾	6.0
	2⅜	8.0	2	7.0
180	2¾	9.0	2 3-16	8.0
200	3	10.0	2⅜	8.0
240	3½	12.0	2⅞	10.0
260	3 9-16	13.0	3⅛	11.0
280	4	14.0	3 5-16	12.0
300	4 5-16	15.0	3 9-16	12.0
320	4-9-16	16.0	3¾	13.0
340	4 13-16	17.0	4	14.0
360	5¼	18.0	4 5-16	15.0
380	5½	19.0	4½	16.0
400	6	20.0	4 13-16	16.0

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

April 11-14, 1916.—Spring meeting of The American Society of Mechanical Engineers, in New Orleans, La.

Deaths.

John Anness, for many years a familiar figure in the sales offices of the Richardson & Boynton Co., New York, died January 22, while on a trip to California. He was 83 years old. Mr. Anness was in charge of the sales floor for the Richardson & Boynton Co., from 1882 until 1909, when he retired from active business. His son, Harry L. Anness, is in charge of the boiler department of the same company. Previous to 1882 Mr. Anness had been engaged in a general heating, tinning and hardware business since 1856.

Frank M. Norton, advertising manager of the *Plumbers' Trade Journal,* New York, died February 21, at his home in Brooklyn. He was 41 years old. His death was due to cerebral hemorrhage and the sudden termination of his illness came as a painful shock to all who knew him. Mr. Norton joined the staff of the *Plumber's Trade Journal* seven years ago and rapidly rose to the position of manager of its advertising department. During this period he established a record seldom equaled in the trade paper field.

Miscellaneous Notes.

J. G. DeRemer, formerly engineer for the American District Steam Co., North Tonawanda, N. Y., has retired from the heating field and is located in New York, where he is looking after his private interests.

F. R. Hutchinson, until recently engineer for the East Ohio Gas Co., Cleveland, O., has been appointed sales manager for the Automatic Draft Regulator Co., of Cleveland. Mr. Hutchinson is the author of the paper on "Gas House Heating," reproduced on another page of this issue.

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PIPE MACHINES, HAND OR POWER

The Tools of Constant Service

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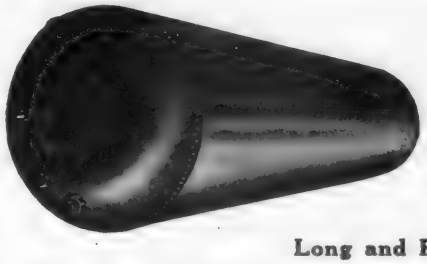

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Copper Hot Water Boilers

For Large Apartment Houses, Hotels, Hospitals, Restaurants, and Public Institutions.

Long and Reliable Service Guaranteed.

Engineers recognize the high character of our product by specifying "The Dahlquist Boilers" on their most exacting work. Write for catalogues

DAHLQUIST MFG. CO., 40 West 3rd Street, BOSTON, MASS

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Boston, Mass.—Renewed efforts to have a separate contract law passed by the Massachusetts Legislature were made at a public hearing on the proposed measure, held at the State House in Boston, Feb. 7. Those on hand in the interest of the bill were William A. Bradford, Quincy, Mass., chairman of the legislative committee of the master plumbers' association, President James S. Cassedy, national president of the master plumbers' association, and Herbert A. Snow, secretary of the Massachusetts master steam fitters' association. Others present were William H. Mitchell, Arthur C. Walworth, Jr., John F. Buerkel, W. F. Farrell, B. F. Carroll, John J. Mullaney, Henry W. Lloyd, George H. McLane and Peter W. Sharp. The bill reads as follows:

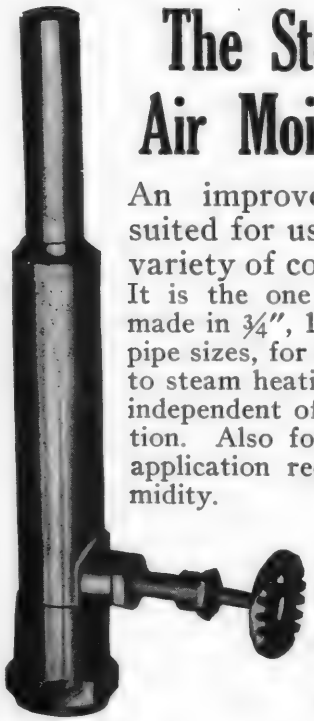
"Section 1. Every officer, board, department, commission or commissioner of the commonwealth of any county, city or town charged with the duty of preparing specifications or of awarding and entering into contracts for the construction or alteration of buildings in cases in which the whole cost of such work may exceed $1,000, shall cause to be prepared separate specifications for each of the following branches of work to be performed: 1. plumbing; 2 steam and hot water heating; 3. ventilating apparatus and power plants.

"Section 2. Such specifications shall be drawn so as to permit separate and independent bidding upon each of the classes of work mentioned in the sub-divisions of Section 1, and all contracts hereafter awarded by any county, city or town or a department, board, commission, or commissioner, or officer thereof, for the construction or alteration of a building or any part thereof shall be awarded separately to responsible and reliable persons, firms or corporations.

"Section 3. Nothing in this act shall be construed to prevent the proper authorities from performing any of the said kinds of work by or through regular employees or by the inmates of any institution where such employment is now authorized by law.

"Section 4. This act shall take effect upon its passage."

Chicago, Ill.—What is described as a fine illustration of the modern tendency is found in a general order to trainmen issued by the general superintendent of the Union Pacific system. This order warns against the overheating of cars and requires that certain temperatures be maintained for the sake of the passengers' health. Following



The Steamo Air Moistener

An improved type suited for use under a variety of conditions. It is the one pipe type, made in ¾", 1" and 1¼" pipe sizes, for attachment to steam heating systems independent of the radiation. Also for industrial application requiring humidity.

The Air Moistener Co.
28 N. Market Street,
Chicago, Ill.

RELIABLE
Vacuum and Vacu-Vapor Heating Equipment is Really RELIABLE

The BISHOP-BABCOCK-BECKER CO.
Manufacturers, CLEVELAND, O.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

is the text of the order issued to trainmen by General Superintendent W. M. Jeffers:

"All sleepers, chair cars and coaches operated over Union Pacific lines are equipped with ventilating systems by which an adequate supply of fresh air is provided.

"Cars must be well ventilated at all times and not allowed to become too warm or overheated.

"High temperature is more detrimental to health than lack of fresh air.

"The following temperatures must be maintained during the cool season:

"Sleepers—Days, 70° F; nights, 60° F.

"Chair Cars and Coaches—Days and nights, 70° F."

Few travelers have ever found trains too cool. Steam heats so readily, and the space in the train is relatively so small that errors in temperature regulation are almost invariably on the side of too much heat. This has been true even of railroads in the far north.

Professor C. E. A. Winslow, formerly director of the division of Public Health Education of the New York State Department of Health, and prominent among heating and ventilating engineers through his activities as chairman for the past two years of the New York State Commission on Ventilation, has been appointed to the Anna M. R. Lauder Professorship of Public Health at Yale University. This is the first endowed chair of public health in the country.

Otto E. Goldschmidt, consulting engineer, New York, announces the removal of his offices to 105 West 40th Street, in the Tilden Building.

T. Russell Robinson, statistical engineer for W. S. Barstow, Inc., New York, gave an address before the American Society of Mechanical Engineers, February 8, on "Ways of Presenting Data for Executive Purposes." The address covered graphical and other methods of showing costs, performance of equipment, output and other items.

British Empire Fair is being arranged to be held at Willesden Garden, England, in the spring of 1917. The exhibition building is expected to cost $1,000,000 and it will cover an area of 610,000 sq. ft. The list of goods to be shown includes machinery and power appliances, building and sanitary materials and lighting, heating and cooking apparatus.

New York.—Members of the four largest national engineering societies will be organized for preparedness under the direction of Major General Leonard Wood, U. S. A. The plan as developed to date includes the organization of civilian engineers into a national reserve corps of engineers so that in case of necessity they could immediately be placed in charge of construction of coast and other defences, releasing the regular army engineers for their usual duties. A series of lectures is being given in the Engineering Societies Building, New York, on various phases of the subject, the remaining dates being March 13, March 20 and March 27.

International Engineering Congress, through its committee of management, an-

Jenkins Bros. Fractional Radiator Valves

For use in connection with Atmospheric, Vapor, and Vacuum Return Line Systems.

Open wide in five-sixths of a turn. Opening is correctly graduated and partial heating of the radiator is easily controlled. The large and plainly marked indicator plate is adjustable and marking can be set to any point in the circle. The Jenkins Bros. Disc. standard of design, metal and workmanship, is an assurance of quality and satisfaction.

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They have a distinctive quality with a fineness of mechanical detail which insures Accuracy and Durability under the hardest Service

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nounces that the volume on mechanical engineering is ready for distribution and the members who have subcsribed to the volume will soon receive it. The other volumes will be issued as rapidly as possible.

American Public Health Association has adopted an official badge showing the figure of Hygeia, the goddess of health. The badge is in blue and white enamel and gold on a rolled back.

Kewanee Boiler Co., Kewanee, Ill., reports that the results of recent tests on Kewanee boilers, both of the straight draft and downdraft, smokeless type, made by Lewis M. Ellison, consulting engineer, show an efficiency for the straight-draft type of from 62.39% to 68.67%. With the smokeless boilers, the efficiencies ran from 73.86 to 81.38%.

National Association of Master Plumbers has arranged to hold its next annual convention in Atlantic City, N. J., the dates being June 20-22. Headquarters will be at The Breakers, the new name for the remodeled Hotel Rudolf.

Chicago, Ill.—The Chicago Department of Health is formulating a proposed ordinance covering the ventilation of garages. The ordinance will provide that a circulation of outdoor air be maintained while the motor is running. In small garages this circulation may be obtained by opening the windows and doors to the outside air. Another method for small garages will be a connection from the exhaust to a pipe leading outdoors.

Chicago, Ill.—Dr. W. A. Evans, writing in the *Chicago Tribune*, under "How to Keep Well," states that the day following the publication of a little notice about a method of humidifying where hot water heat is used he received 289 requests for reprints describing same. The second day he received 286. He urges inventors and manufacturers of heating and ventilating apparatus to take notice.

Aurora, Ill.—At a meeting of the Parent-Teachers Club in Aurora recently addresses were made by President C. E. Colwell of the school board, Superintendent S. K. McDowell and J. B. Wigman, consulting engineer, of Chicago, on heating and ventilating methods, with special reference to the necessity of closed windows in the operation of such systems as that installed in the Oak Street School. The feature of the occasion, however, was the demonstration made by Mr. Wigman. He had a model house set up on the stage and used smoke to show the course of air in the various

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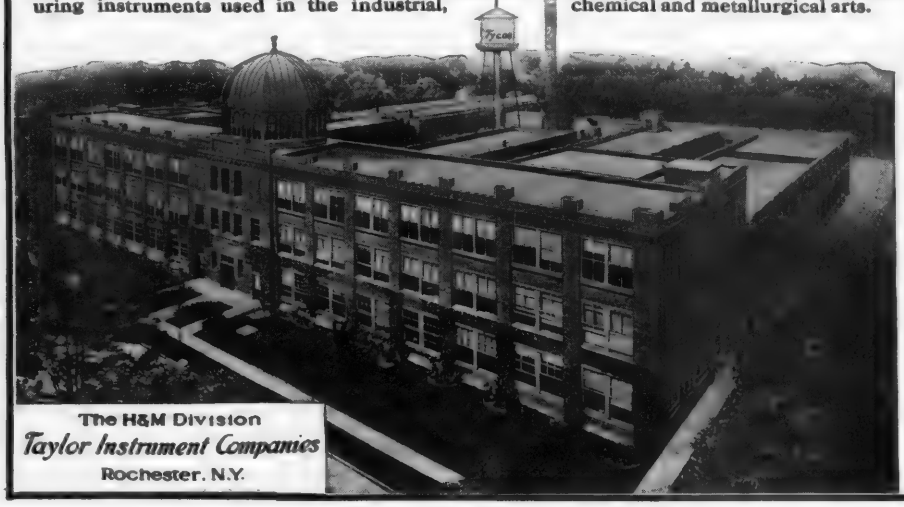
To Investigate OUR Facilities, will set aside any question as to our preminence in the field of Industrial Thermometry. You can then see for yourself the processes and system of inspection and tests that have made *Tycos* the synonym for unsurpassed accuracy in the measurement of temperature.

We are specialists in the manufacture and design of H&M Type Thermometers, *Tycos* Recording and Indicating Thermometers, Automatic Temperature and Pressure Regulators, Mercury Vacuum, and Absolute Pressure Gauges, Engraved Stem Thermometers, Hydrometers, Hygrometers, Thermo-Electric and Radiation Pyrometers, and many other measuring instruments used in the industrial, chemical and metallurgical arts.



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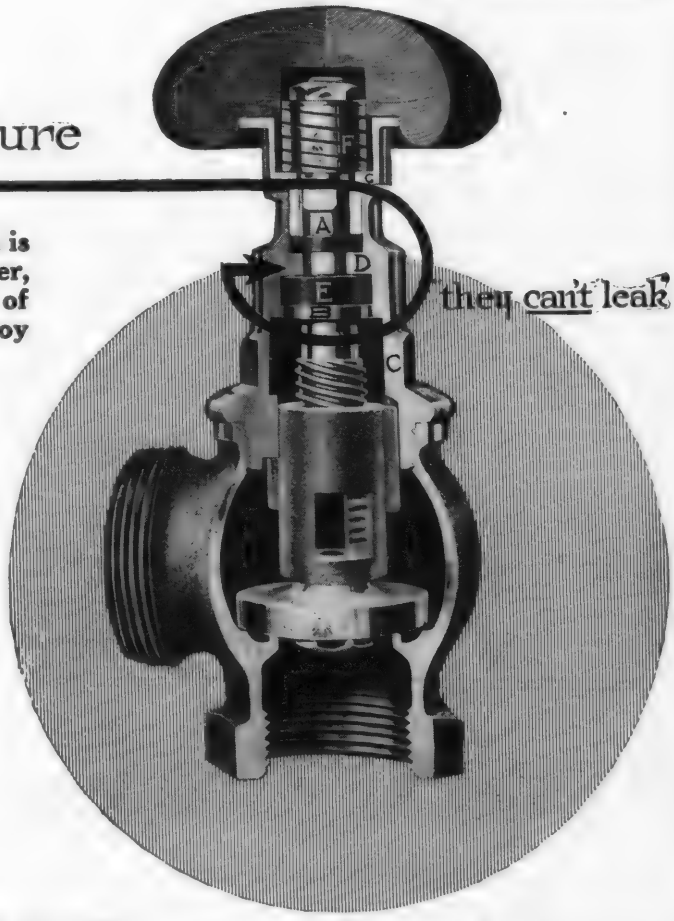
This is the Packless Feature

—a construction that is not affected by water, heat, steam, or any of the causes that destroy packing.



they can't leak

Integral with the stem "A" is the collar "B." On the upper side of collar "B" and lower side of internal flange "D" are circular V-shaped projections. Between these is placed the disc "E," which is forced under pressure into the recess in the bonnet "C" and in that position disc "E" and flange "D" are reamed so as to insure an accurate fit for the upper part of the stem "A." Disc "E" is held here under compression by means of the spring "F" acting on stem "A" through collar "B." Spring "F" has a lower bearing on the internal flange of handle holder "G." This construction makes it impossible for steam to rise in the valve above the collar "B"—construction that will not wear by continued use.

Economical

No damage, expense or inconvenience, caused by the leakages incident to ordinary valves. **Once installed there is no more expense—no upkeep cost.**

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An ornament in any surroundings—symmetrical, and handsomely finished—a quality product that will satisfy the most critical trade.

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The Detroit Packless Valve embodies an exclusive idea in Radiator Valve construction that eliminates the objectionable features of packing. High grade material and substantial construction—a strong, serviceable, specialized product, of established character. **Made in styles and sizes for any installation of steam, and hot water systems.**

Booklet on Request.

DETROIT LUBRICATOR COMPANY

DETROIT, U. S. A.

Canadian Detroit Lubricator Company, Ltd. WALKERVILLE, ONTARIO.

rooms. Another test was made in the school building itself by introducing hydrogen sulphide gas into the intake of the ventilating system and placing blotters soaked in a 15% solution of lead acetate in different spots in one of the rooms in which it was suspected that there might be a "pocket" of bad air. When the gas came in contact with the blotters the blotters turned from a bluish white to a reddish brown. The blotters were placed in corners and in various secluded spots in the room, as well as in the center and around the seats. Then the fan was started and left running for ten minutes, pumping gas through the rooms. At the end of that time every blotter had turned to a reddish brown.

Chicago, Ill.—Through a contract signed with the Chicago Pneumatic Tool Company, the Little Giant, Model H, motor trucks will hereafter be equipped with Garland ventilators, for use in exhausting from the motor compartment the heat that comes from the engine. These ventilators are designed to exhaust 25,000 cu. ft. of air per hour, with the car traveling at medium speed. It is estimated that the use of the ventilator will greatly increase the efficiency of the engine. The device is similar to the Garland ventilators used on Pullman railroad coaches.

Detroit, Mich.—The Dime Bank and Ford Building will hereafter be heated from the Dime Bank Building. A 7-ft. connecting tunnel under Griswold Street connects the two buildings. The Ford Building was until recently supplied by heat and power by the Detroit Edison Company, but the large capacity of the Dime Bank plant made the new arrangement more advantageous. The buildings are the largest structures in the city, and house 3,000 people. The Dime Bank plant is composed of five 250 K. W.

AIR CONDITIONING

never involves too complex a problem if you avail yourself of our advice.

See our large ad in last month's issue.

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Engineering Corporation

39 Cortlandt St., New York

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Webster Air Conditioning Apparatus

Webster Air-Conditioning apparatus is constantly demonstrating its capacity, under a wide variety of exacting conditions, to effect and maintain any desired temperature and humidity.

Wherever a highly efficient and thoroughly dependable air-cooling or air-conditioning system is required, Webster apparatus, by reason of exclusive advantages, merits unquestioned consideration.

Widely installed in hotels, restaurants, office and administration buildings, as well as industrial establishments where special air-cooling and air-conditioning problems are to be met.

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ESTABLISHED 1888 **CAMDEN, N. J.** **BRANCHES IN PRINCIPAL CITIES**

Sturtevant Air Washer in the Uniontown High School, Pa.
Architect, Andrew P. Cooper

The Uniontown High School

HAS A

Sturtevant
(REG. U. S. PAT. OFF.)

Air Washer

In the Craig Street School at Uniontown, Pa., there is a 6 x 8 Sturtevant copper Air Washer. It is 7 ft. long in the direction of the flow of air and is equipped with nozzles of the atomizer type.

In addition to the Air Washer, the Multivane Fan, Heater and tempering coils were supplied by this company.

Sturtevant Air Washers are becoming more and more popular as indicated by the large number of prominent buildings in which they are installed and by the list of prominent engineers who specify them. A few buildings having Sturtevant Air Washers are:

Cleveland City Hall
Parkway Central Building, Philadelphia
Dormitory, Wellesley College
Miami Hotel, Dayton, Ohio
Buck & Raynor Building, Chicago
Deshler Hotel, Cleveland
Detroit Post Office
Bank of Italy, Los Angeles, Cal.
Frankfort High School, Phila.
Cleveland City Hall.
East Ohio Gas Company Building, Cleveland
Rochester No. 17 School

B. F. STURTEVANT COMPANY

Hyde Park, Boston **Massachusetts**

And All Principal Cities of the World

electric generators and four 350 H. P. boilers.

Chicago, Ill.—The "fresh air" cars on the Chicago surface lines have been discontinued. According to Commissioner of Health John Dill Robertson, they have been entirely successful inasmuch as they created discussion and brought the street car problem prominently before the public, that they showed how difficult it is to properly ventilate a car by the use of windows, and, finally, that they impressed upon the citizens of Chicago the fact that a certain exposure to unfavorable physical conditions tends to strengthen the bodily resistance and promote health.

Chicago, Ill.—According to the semi-annual report of Oscar F. Nelson, State factory inspector, important results were obtained from the crusade for fresh air in factories and workrooms. Orders directing the installation of 179 artificial means of ventilation were issued. Two hundred and forty-two workrooms in 179 establishments were inspected and only four were found to have a supply of fresh air equal to the legal requirements.

Chicago, Ill.—Approximately $250,000 is to be spent by the Chicago surface lines in improving the ventilation of 1,500 street cars. The new system will do away with the use of small windows near the ceiling in the monitor-type cars. It will involve the installation of roof intakes, additional heating apparatus to take care of the additional air, and thermostats to regulate the heat. The work of making the changes will be begun at once at the company's shops.

Washington, D. C.—Secretary McAdoo, of the Treasury Department, plans to increase the number of public buildings to be served by the proposed central heating, lighting and power plant and has sent to Congress a draft of legislation designed to increase the limit of cost on the plant from $1,494,104 to $1,669,104. He would add to the long list of buildings already to take service from the plant the Johnson-Walker Building, known as the navy annex; the Interior Department Building, the Lincoln Memorial and the Women's Memorial (Red Cross Building). The serving of these additional buildings, he states, will have the effect of reducing the unit cost of steam and electricity in the central power plant and will also result in a saving on the building now contemplated under the present act; and a saving on the four buildings mentioned of $30,000 per annum over what it would cost to make steam in the buildings and purchase the current from the Potomac Electric Company.

A damper controlled by a

PARKER DAMPER QUADRANT

—the ideal combination.

Have you a copy of our new booklet?

PARKER SUPPLY COMPANY

Makers of Expansion Bolts, Screw Anchors, Toggle Bolts and Sheet Metal Workers' Specialties.

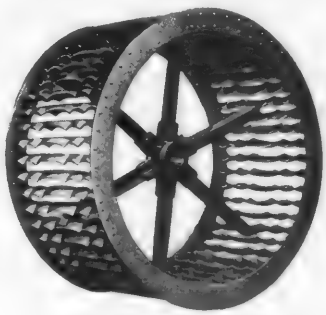
515 W. 45th St., New York

Sturtevant Multivane Fans for William Penn Hotel

Twenty-three Sturtevant Multivane Fans were supplied for the William Penn Hotel, Pittsburgh, and above photograph shows them on the sidewalk after being unloaded from trucks.

Recent improvements in the Multivane Fan put it still further in advance of all other makes in efficiency.

Our Engineering Department is the largest and most capable body of trained fan engineers in the world. They will be glad to co-operate with you on any heating, ventilating, or air conditioning proposition you may have on hand.



Multivane Fan Wheel

Sturtevant
(REG. U. S. PAT. OFF.)

Get our bulletin on Electric Fans. It lists small motor-driven fans for all voltages, speeds and net prices to consumer giving pressures, volumes, dimensions,

B. F. STURTEVANT COMPANY
HYDE PARK, BOSTON, - MASSACHUSETTS
- - - And All Principal Cities of the World - - -

Waterloo, Ia.—An accident to a large fan in the West High School recently by which the belt controlling the governor came apart, resulting in a high fan speed, created a condition that led the local paper to characterize the fan as an efficient vacuum sweeper. It is stated that the rooms in the upper part of the building were treated to a cloud of dust while a student in the act of opening the gymnasium door in the basement had the door literally jerked from his grasp. The gymnasium itself, continues the report, was swept clean of dust.

Cleveland, O.—The Cleveland city officials have begun an investigation of the shortage in the natural gas supply which recently almost fell to the vanishing point. Gas company officials explained that there was trouble with the mains connecting Cleveland with the West Virginia fields, which are the source of supply. Manufacturing concerns were obliged to close down, and 1,000 school children were sent home on account of cold school rooms.

Chicago, Ill.—A new method of securing good air conditions in Chicago was adopted recently when the mothers of the children attending the Henry Clay School, at East 133d Street and Burley Avenue, called a strike by keeping their children out of school on account of objections to the heating and sanitary conditions in the school building. Only 119 out of a total registration of 450 children attended school for several days.

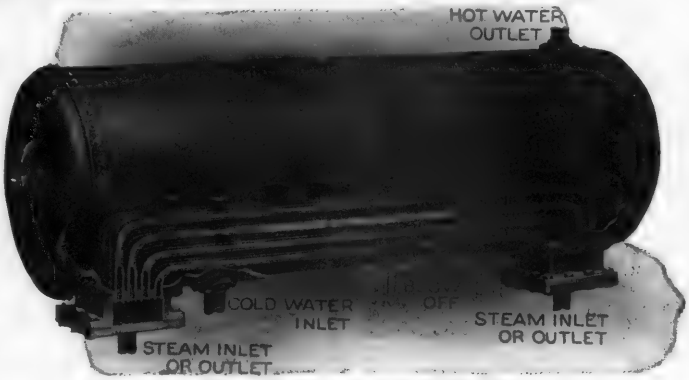
Building Operations for January, 1916, continued the good showing made by the last few months of 1915. The total for 110 cities, as compiled by the American Contractor, came to $51,697,497 as compared with $38,224,968 for January, 1915, an increase of 35 per cent. New York City, outside of Brooklyn, showed a falling off of 26 per cent., but this is explained by the fact that in January, 1915, permits for two buildings of over $1,000,000 each were issued. Building operations for December, 1915, covering 72 cities, showed an increase of 84 per cent. The total net gain for the year 1915, over 1914 was 5 per cent.

Central Station Heating Notes.

Spokane, Wash.—The proposed franchise in favor of Fred B. Grinnell to operate and maintain a central heating system in Spokane passed its second reading before the city council, January 10. It is proposed to operate the system within a radius of ten blocks of the corner of Howard and Riverside Streets, and to spend at least $100,000

THE ⌐¬ SHAPE TUBES EXPLAIN THE SUCCESS
of the
PATTERSON HOT WATER TANK

for heating water for domestic or manufacturing purposes. Both ends of each seamless brass tube are expanded into heavy cast-iron tube-heads with an improved roller expander. Their shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.



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Any Combination of Storage and Heating Capacities Can be Furnished.
Send for Catalogue.

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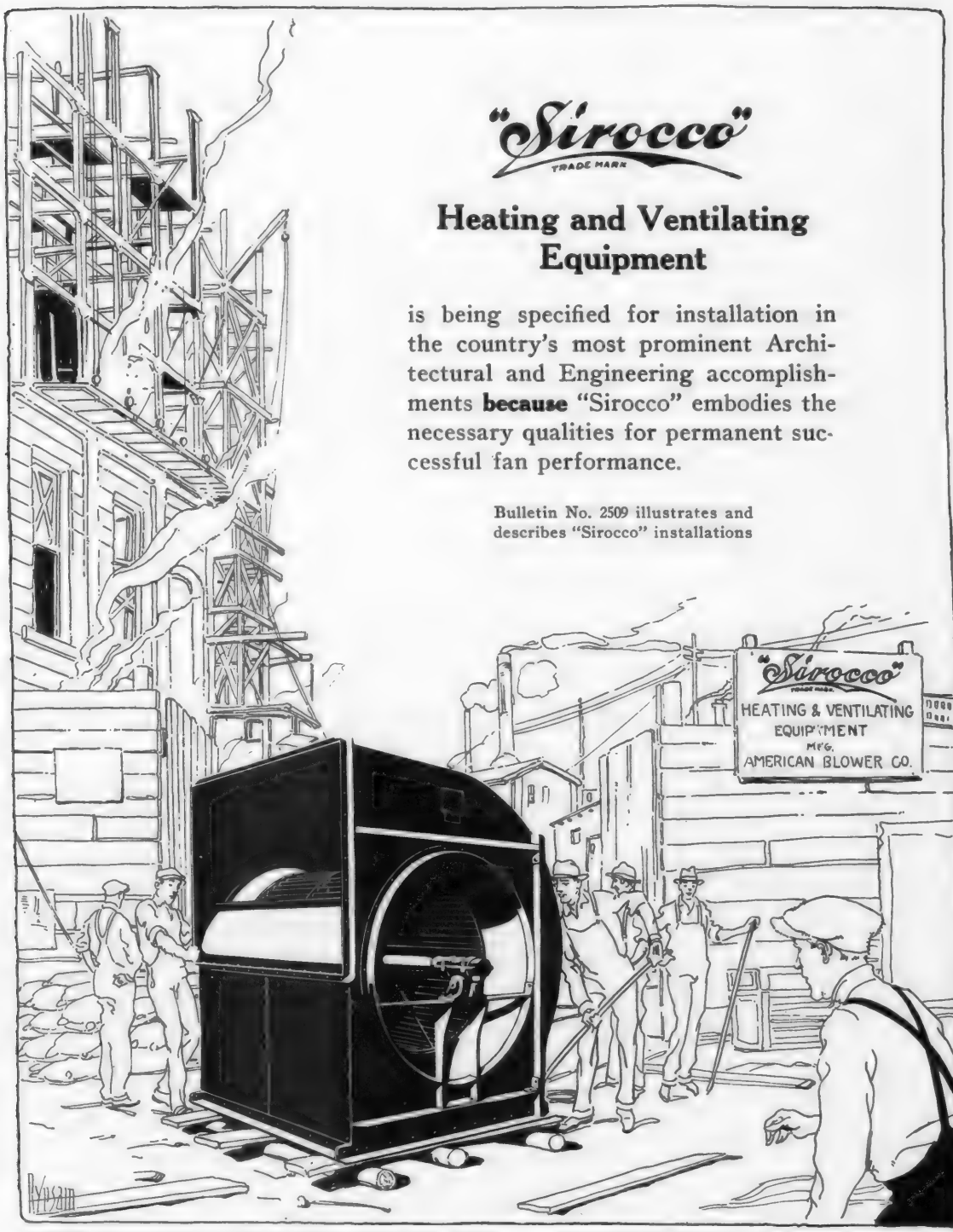
Representatives in all Principal Cities



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is being specified for installation in the country's most prominent Architectural and Engineering accomplishments **because** "Sirocco" embodies the necessary qualities for permanent successful fan performance.

Bulletin No. 2509 illustrates and describes "Sirocco" installations

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

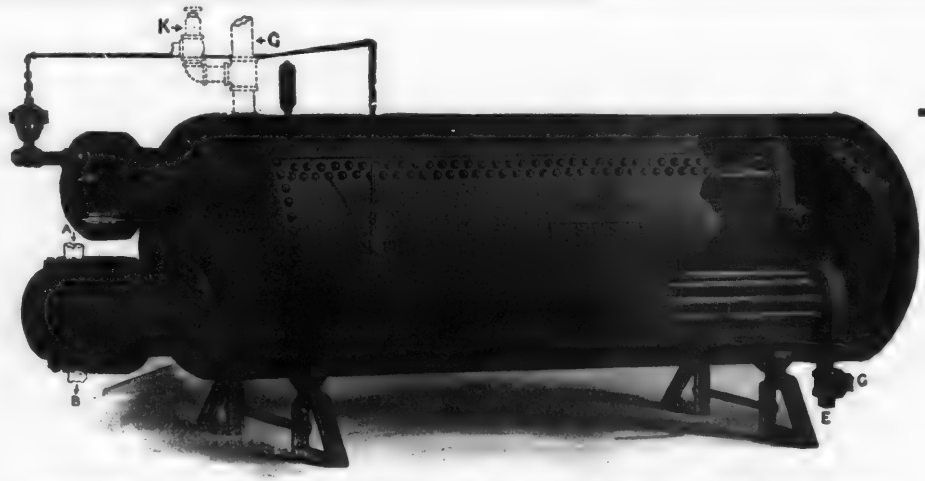
in three years. The council was to vote on the franchise February 14. The proposed franchise is being opposed by the Public Welfare League on the ground that it is similar to one already in force and that one company is enough to occupy the field.

Spokane, Wash.—A peculiar situation has arisen in Spokane in connection with the laying of heating mains through the business section of the city. It seems that a franchise for operation was granted to the Trustee Company and permits for construction have been issued under the name of the Merchants' Heating Co. Commissioner Fasset of the public utilities division, stated that the city had no record of a transfer of the franchise. The matter was taken up by the city council. Announcement is made that the Merchants' Heating Company will not stop with heating merely the business section, but that the service will be extended to the residential sections. In the first unit in the downtown district, between Railroad and Trent Streets and Division and Monroe Streets, the company expects to spend close to $650,000. The next unit will include the library on the west, with a main to the Sacred Heart Hospital, and eventually, a service for the South Hill residential district. The company has already contracted to heat 23,000,000 cu. ft. of building space in the downtown section, representing over 20 hotels, office and mercantile buildings. E. Darrow is the general manager of the company.

Des Moines, Ia.—The Des Moines Electric Company's heating franchise will be voted on by the people at the city election March 27. If the franchise is granted, it is planned to begin work early in the spring and to have the plant in operation by next fall.

Indianapolis Light & Heat Co., Indianapolis, Ind., has pettioned the Indiana Public Service Commission for authority to issue $375,000 in stock and $250,000 in bonds, to reimburse the treasury for money expended on improvements.

Tacoma, Wash.—The first intimation that the Central Heating Company, a recently enfranchised concern, does not intend to build and operate a central heating plant in Tacoma, was given by the city council January 21, when an ordinance, giving the Fidelity Trust Company permission to heat the Warburton Building, at Eleventh Street and Broadway, was unanimously passed. According to the provisions of the franchise, the Central Heating Com-



WHEN THE HOT WATER DEMAND RUNS HIGH

Our large experience in manufacturing heaters for laundries has developed the fact that there is not always enough exhaust steam to heat all the water to the temperature required. This is always the case with a wet-wash laundry. For a high hot water demand use the

SIMS CLEAN E-Z HEATER, TYPE D.

This heater is supplied with two sets of straight, seamless drawn brass tubes, the lower for exhaust steam, located in the coolest water. The upper set of tubes is for live steam direct from the boiler, controlled by a thermostat.

Our Bulletin HL-2 gives full particulars of Sims Heaters for laundries, hotels, hospitals and other service. Consultation free. All work guaranteed.

THE SIMS COMPANY **18th Street, Erie, Pa.**

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When we claim that J-M Products are "Reliable" we use the word in its severest interpretation. We mean the strictest adherence to constant, consistent goodness.

And even more than this; for as a second line defense, we reinforce this Reliability with J-M Responsibility, the personal promise of a National Institution.

J-M Sectional Conduit solves the problem of out-of-doors heat transmission

Any group of buildings may now be economically heated from a central plant. The problem of efficiently transmitting live steam, exhaust steam, hot water, etc., underground for long or short distances, finds a satisfying answer in **J-M Sectional Conduit.**

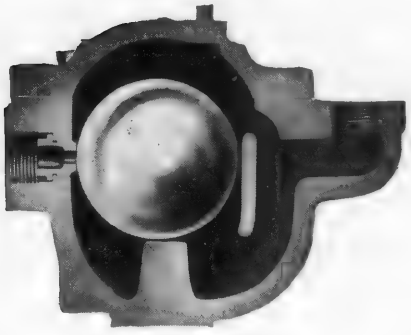
Power in the form of live steam may now be directly transmitted.

District heating, utilizing exhaust steam, becomes more profitable.

This system, which is complete in every detail except the steam pipes proper, is fully discussed in a bulletin that you should have on file. Nearest branch has it.

J-M Sectional Conduit at Battle Creek Sanitarium, Battle Creek

Too strong to break—too positive to fail—too simple to air bind—the J-M Steam Trap



It has no levers to break or strain—no valves to stick or clog—no screws to strip—no cotters to drop out—no adjustments necessary.

There is absolutely nothing in the make-up of this trap to get out of repair. It can't hammer, stick or air-bind.

Its only moving part is a rolling ball—that's all. When the condensate rises, it rolls the ball up from the outlet nozzle, releasing water, air and gas at the same time.

It is made in all sizes for all pressures.

Our nearest branch will answer all questions. Just ask them.

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THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED

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pany was required to begin operations in Tacoma by March 1, 1916.

West Liberty, Ia.—The town council is giving consideration to the plan to utilize some of the waste heat at the municipal power plant for commercial purposes. By the installation of a larger boiler, the plant could produce enough heat to supply a large part of the town's private needs.

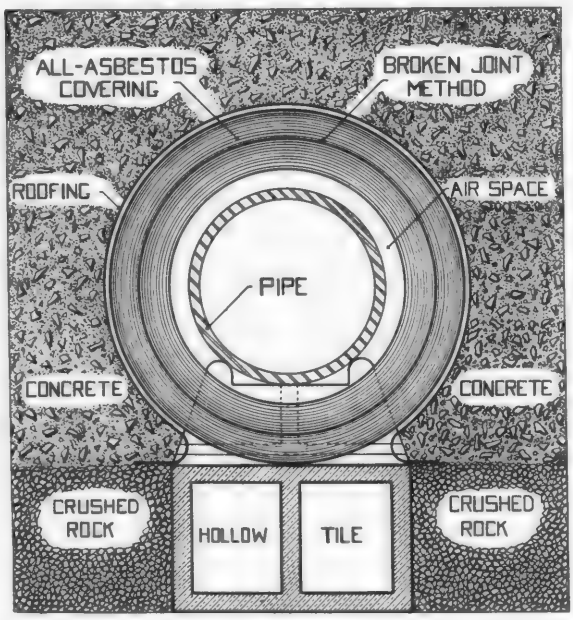
Hibbing, Minn.—Revised municipal heat charges, effecting material reductions to consumers, have been agreed upon by the water and light board. After a number of protesting consumers were questioned by W. J. Ryder, chairman, they agreed to accept the board's proposition to furnish municipal heat at the actual cost, plus an additional charge of 10 per cent. for the convenience afforded by the municipal service. P. E. Clark had gathered statistics showing the actual cost of heating with private plants and the comparative cost when using municipal heat. Consumers appeared at the meeting with a petition for a new municipal water and light plant, but this was withdrawn.

Goshen, Ind.—A central heating plant, possibly municipally-owned, is being considered in Goshen. Herbert A. Seward, consulting engineer, of Chicago, has drawn rough plans for a heating pipe line to run from the local water works to Goshen Hospital.

Askley, Ia.—Askley owns its own steam heating plant. The rate, heretofore, has been 65 cents per 1,000 lbs. of condensation. The public treasury has been benefitting to such an extent on this basis that a reduction has been announced to 50 cents per 1,000 lbs. of condensation.

Saginaw, Mich.—One of the final steps in the transfer of the interests of the Saginaw Heating Company to the Consumers' Power Company was taken January 21, when articles of dissolution were filed with County Clerk L. L. Pearson.

Sibley, Ia.—The Commercial Club of Sibley has appointed a committee, consisting of H. E. Walton, H. E. Scott and J. J. Shoemaker, to investigate the proposition of establishing a central heating plant in Sibley. The committee will first investigate the Worthington plant. The idea was presented to the Commercial Club by L. A. Larsen, of St. Paul, who stated that Sibley's business district was well located for the operation of such a system. It would cost about $17,000 for the installation, said Mr. Larsen, who added that the revenue received from the sale of heat, although



A type of Heating Mains with few specials—easily installed—permanent

INDESTRUCTIBLE

Conduit is made of CONCRETE and every LOCALITY "has the MAKIN'S"

Let me furnish you the covering, expansion joints, etc., together with complete specifications to meet your case.

Ask for quotations or estimates.

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Ric-wiL MethoD
of
Insulating Underground Pipes

Double Insulation — Diatomite composition moulded onto the conduit. (Conduit is serrated to hold insulation.) Loose Non-settling Ric-wiL Asbestos Silica Fibre.

Perfect Underdrainage—The life of any underground heating system. Ric-wiL Interlocking Base Drain always insures a dry ditch.

Highest Efficiency—Lowest Installation Cost—Permanent

The Ric-wiL Underground Pipe Covering Co. 623 New England Bldg. CLEVELAND OHIO

The Mouat Heating System
Extremely Simple

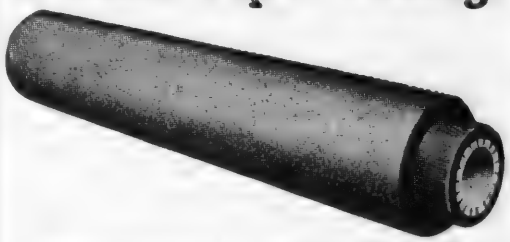
The natural laws of **steam expansion** and **gravitation** co-operate in the Mouat Graduating Vapor Heating System to get the desired results. Since these laws are inviolable, and, furthermore, because no complicated mechanism is used, the Mouat Vapor System must continue indefinitely to give good satisfaction.

Coal, gas or coke can be used as fuel with equally good results. No matter what the weather conditions or how rapid the changes in temperature, you will never have to suffer the inconvenience of periods of uncomfortable heat or cold. With this heating system, you **may expect** and **will get** mild, healthful heat, **when** you want it, **where** you want it, and in **just the right amount** for comfort.

Write **today** for booklet, "The Attainment of Perfect Heating," and catalog. You be the judge of this system.

Manufactured by
The MOUAT STOVERS Co.
Cleveland, O., U. S. A.
At 1244 W. 4th St.

STANDARD
Steam Pipe Casing



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STEAM PIPE CASING

We also make unlined casing.

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it would be no more than the present cost of fuel heat, would more than pay for the plant in seven years, and in about fifteen years the saving would pay for both the electric light plant and heating system.

Manufacturers' Notes.

William H. Page Boiler Co., New York, has moved its New York offices to 141-145 West 36th Street, in the Herald Square Building. The office is in charge of W. P. Davenport, secretary of the company.

Globe Stove & Range Co., Kokomo, Ind., has appointed Dr. William F. Colbert as manager of its furnace department. Dr. Colbert was formerly with the Sill Stove Works, Rochester, N. Y.

Federal Radiator Co., New Castle, Pa., has appointed George W. Barr eastern sales manager, with headquarters at 1402 Land Title Building, Philadelphia, Pa. The company manufactures both boilers and radiators. Mr. Barr was formerly Philadelphia manager of the United States Radiator Corporation and has long been identified with the heating trade.

American Radiator Co., Chicago, Ill., reports operations in the United States at about normal, all on domestic orders, according to the Chicago Herald, with indications that there will be no diminution the remainder of the year.

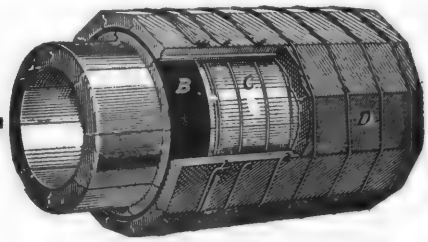
Chamberlin Metal Weather Strip Co., Detroit, Mich., has appointed H. W. Whitten as district manager for the States of Kansas and Nebraska. Mr. Whitten, who was formerly sales manager for the Chamberlin Weather Strip Co., of Boston, Mass., will make his headquarters in Kansas City, at 20 Bryant Building.

Bishop-Babcock-Becker Co., Cleveland, O., according to reports, has arranged for the export of a large line of its goods to South America, where they will be handled by a recently-organized selling force. The company's products include brass goods, pumps and acetylene welding apparatus, as well as heating devices.

Pressed Metal Radiator Co., Pittsburgh, Pa., announces the resignation of John K. Frye as president of the company. Mr. Frye will become general purchasing agent for the Donner Steel Co., of Buffalo, N. Y., formerly the New York State Steel Co., of which W. H. Donner is president. Mr. Frye will make his headquarters in Buffalo.

C. A. Dunham Co., Marshalltown, Ia., announces the removal of its Milwaukee office to larger quarters at 442 East Water Street. The office is in charge of C. L. Chase, the company's Milwaukee manager.

Ohio Brass Co., Mansfield, O., announces



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B—Asphaltum Packing.
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Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

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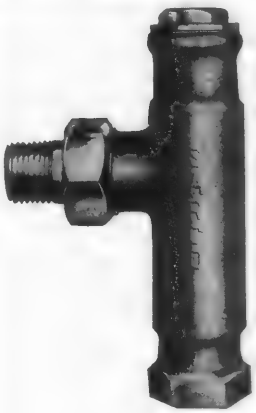
Pittsburgh, Pa., Johnson-Peter Co., Pittsburgh Terminal Warehouse



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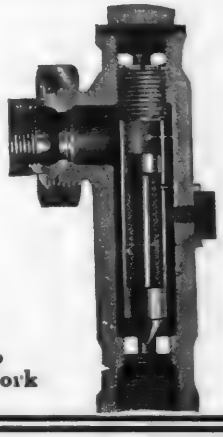
Two Pipe Low Pressure — Vapor —Vacuum Heating Systems

Principle—Thermostatic
Motive Power—Liquid Expansion and Contraction



Positively noiseless in operation. No place for scale and dirt to lodge. Contact between head of valve and seat a line instead of surface. Distance inlet to outlet 3″ or 1¾″ and can be installed at any angle. Guaranteed not to stick or air bind. You cannot buy a more accurate Radiator Trap no matter how much more you pay for it.

Send today for list and trial offer

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ECONOMY VACUUM PUMPS

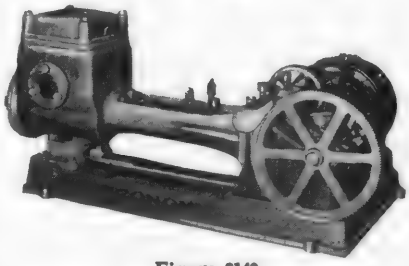

Figure 2149
Economy Motor Driven, Direct Acting Vacuum Pump, Double Acting Type

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Vacuum Pumps, for two pipe or air line systems—automatic electric or hand control.

Automatic Condensation Pumps and Receivers.

Economy Pumping Machinery Co.
116-118 N. Carpenter St., Chicago
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Correct Engineering Principles
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ALBERGER MULTI-HEAD WATER HEATERS

Horizontal or Vertical

Proper provision is made for expansion and contraction of the tubes. Built of the highest grade materials, consisting of pure copper and cast-iron.

For boiler feed water, gravity and forced circulation heating systems, hot water service for domestic purposes, etc. Catalogue on request.

ALBERGER HEATER COMPANY, BUFFALO, N. Y.
CHICAGO, ILL.

the removal of its New York office to the eighteenth floor of the Hudson Terminal Building, 30 Church Street. The company's quarters are at 1822 Cortlandt Street section.

New Incorporations.

American Humidifier and Ventilating Co., Holland, Mich., capital $50,000, to manufacture humidifiers for use in connection with warm air furnaces. President, Gerrit J. Diekema; vice-president, John H. Kleinheksel; secretary, Frank Kleinheksel; treasurer and manager, Christian Becker; other directors: Con De Pree, Edward Dimment, George E. Kollen, Daniel Ten Cate. The company has taken the Tappan Plant on West 12th Street and commenced operations early in February. The humidifier made by the company is designed to be attached to the smoke flue, the heat from the flue being utilized to vaporize the water.

C. William Krausse's Sons, Inc., North Plainfield, N. J., incorporated to take over the heating and plumbing business of C. William Krausse, at 23 Vine Street.

E. J. Swanson Co., Lowell, Mass., incorporated to conduct a heating and plumbing business. President, W. H. Curtis; treasurer, Ernest J. Swanson; director, M. Swanson.

E. J. McCarthy Co., Northampton, Mass., incorporated to conduct heating and plumbing business. President, J. E. McCarthy; treasurer, Eugene J. McCarthy; director, J. J. McCarthy.

Volz, Secord & Co., Batavia, N. Y., capital $15,000, to conduct a heating and plumbing business.

Stockton Radiator Co., Stockton, Cal., incorporated to manufacture steam and hot water radiators. Among the principals is Thomas N. Burnam.

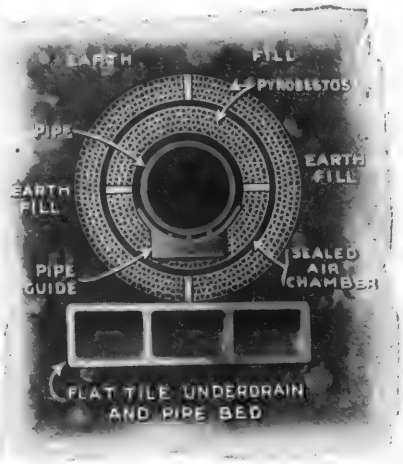
Wilmont Ventilating Co., Roanoke, Va., capital $50,000, to manufacture ventilating systems. President, G. T. Greer; secretary-treasurer, Mosby Montague, both of Roanoke.

Geo. W. Munce Co., Batavia, N. Y., capital $30,000, to conduct a heating and plumbing business. Incorporators: G. W. Munce, M. C. Munce, and S. J. Munce, all of Batavia.

Steele & Torrance Co., Batavia, N. Y., capital $50,000, to conduct a heating and plumbing business. Incorporators: J. G. Torrance, R. L. Steele and O. C. Steele.

Crystal Park Heating and Ventilating Co., Canton, O., capital $5,000. Incorporators: Alois Kliever, C. A. Pontius, Mrs. Alois Kliever and A. M. Pontius.

Honeywell Heating Specialties Co., Wa-



Pyro-Bestos Underground Pipe Insulation

For piping from central heating or power station to detached buildings of Universities, Asylums, Hospitals, Factories, etc. Also as underground Pipe Conduit for heating private Auto garages direct from House heating system. Lasts longer than Wood; in fact indefinitely. Easily applied and of reasonable cost. Is water repellant,—does not absorb moisture like Magnesia, Infusorial Earth or the loose filling in Tile Conduit systems, all of which materials acting like a wet sponge held against the piping soon rust holes in the piping. We have cases on record where Insulations of the absorbent type have totally destroyed the piping in five years and less after installation, making it necessary to go all over again with the cost of digging trenches, new piping and new Insulation. No material of an absorbent nature should be placed around underground piping. Test all underground Insulations offered you by placing a fragment in a glass of water. If it absorbs water, don't use it.

National Air Cell Covering Co.

210-220 Van Brunt St., Brooklyn, N. Y.

Davis Pressure Regulators Save Steam

DAVIS

When economy suggests or necessity demands the use of steam at less than boiler pressure use A DAVIS REDUCING VALVE.

This automatic device saves steam by delivering the exact amount required and no more. Being simple in construction and positive in action you may rely upon it for efficient service.

For forty years Davis Valves have been used by men of experience who demand the best possible results from their equipment.

G. M. DAVIS REGULATOR CO.
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VALVES

Use Mueller Regulating Valves

MADE of the best material procurable and put together by skilled mechanics, Mueller Valves stand up under the most exacting conditions. They're built right and can be relied upon to give dependable service.

It makes no difference what pressure you want to control—steam, air, oil, water, gas, acetylene or oxygen, etc.,—there's a Mueller valve that will meet the requirements.

Our line is complete. It covers every phase of pressure reduction and regulation. Large and small plants of every kind are using Mueller Valves and they speak only praise for them.

We shall be glad to send you our catalog giving complete information in regard to the Mueller line.

Write us today.

Reducing and Regulating Valve and Pump Governor

H. Mueller Mfg. Company

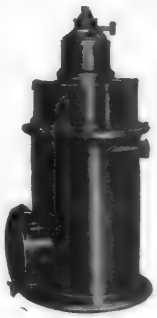
New York 145 W. 30th St. **DECATUR, ILL.** San Francisco 589 Mission St.

Maker of High Grade Water, Plumbing and Gas Brass Goods

bash, Ind., capital $25,000, has been formed to take over the business of the Honeywell Heating Specialty Co., of Wabash. The new firm differs but little from the former company. A slight change was made in the name and the new list of directors does not contain the names of Joseph C. Teague and H. H. McNamee, vice-president and treasurer, respectively, of the old company, who have retired. The directors named in the incorporation papers are Mark C. Honeywell, Olive L. Honeywell and Willard C. Huff.

New Firms and Business Changes.

W. H. Johnson & Co., Indianapolis, Ind., heating and ventilating engineers and contractors, announce that the business has been taken over by R. A. Shirley and R. E. Poehner, both of whom were formerly in the employ of the company, Mr. Poehner as superintendent and Mr. Shirley as secretary-treasurer. Mr. Shirley succeeds W. H. Johnson as president of the company, and Mr. Poehner becomes secretary-



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Spencer Turbine Vacuum Cleaners

are manufactured in sizes from ¾ H. P. to 40 H. P.

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Your Choice of Seven Types

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Public Building Ventilation

requires the moving of large volumes of air without the noise of machinery.

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have excellent performance qualities, being quiet and free from vibration and are, therefore, extensively used in the ventilation of—

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There is a Westinghouse Motor for every type of ventilation, for every size of building, for blowing or exhausting.

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For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS

FOR STEAM HEATING SERVICE

(Classes "Q" and "Q H") lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

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These Valves are fully explained on Pages 29 to 33 of our General Catalogue, No. 20.

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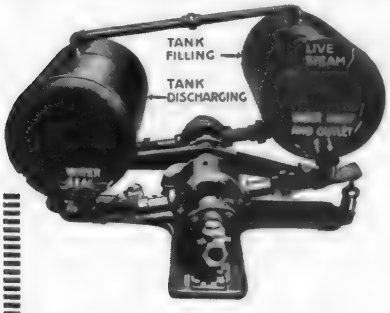
PITTSBURGH, PA., 518 Park Building
PHILADELPHIA, PA., 601 Harrison Building
BOSTON, MASS., 161 Summer Street



Efficient Heating

with steam is largely a question of efficient drainage.

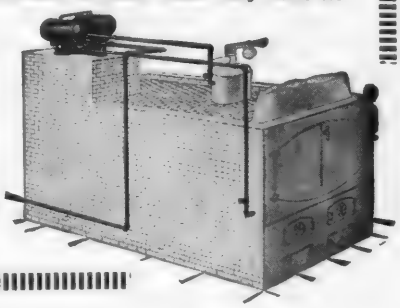
Thorough drainage can be most effectively and economically obtained through the use of

AMERICAN DUPLEX

Return Steam Traps

For receiving water of condensation from any source and automatically delivering it into the boiler as feed water they have no equal.

A Continuous Drainage and Continuous Feed Return Trap



To Heating and Ventilating Engineers

We have an especially attractive plan and proposition for you—one that will enable you to turn unprofitable drainage propositions into profitable ones. Get the details—Write.

American Duplex Steam Trap Co.

414 Moffat Building, Detroit, Mich.

treasurer. D. G. Coates will be retained as chief engineer and the business will be continued without change of name. The retirement of Mr. Johnson was necessitated by poor health and his son, J. W. Johnson, is also leaving the company.

W. L. Bronaugh, Chicago, Ill., has engaged in the heating and ventilating contracting business, with offices at 505 Transportation Building, Chicago. His shop is located in the northwestern section of the city. Mr. Bronaugh is the secretary of the Illinois Chapter of The American Society of Heating and Ventilating Engineers.

B. P. Lyon, Toledo, O., has started a heating and plumbing business of his own at 142 North Eleventh Street, Toledo. He was formerly with the Holmes & Landwehr Co., to whom he sold his interests in that firm. He reports contracts on hand for heating the plant of the Tillottson Manufacturing Carburetor Co.; also for installing a vacuum heating system in the plant of the Dohler Die Casting Co., the latter contract amounting to $7,500.

Contracts Awarded.

John R. Elm Co., Chicago, Ill., furnishing pipe covering and pumps for the new heating plant at the University buildings in Bloomington, Ill., for $8,685.

Grunwald Co., Omaha, Neb., heating and plumbing new Hotel Ottumwa, at Ottumwa, Ia.

Leitelt Iron Works, Grand Rapids, Mich., heating Commercial Savings Bank Building, in that city. The plant was designed by B. E. Parks & Son, of Grand Rapids.

Barlow Bros., Co., Waterbury, Conn., heating and ventilating new Lincoln School in Waterbury, for $13,527.

Ideal Heating & Construction Co., Davenport, Ia., heating and plumbing new Y. M. C. A. building in Dubuque; 6,000 sq. ft. of radiation will be installed.

Allen-Scales Engineering Co., Nashville, Tenn., heating and ventilating Pearl and Elliott Schools, in Nashvile, for $8,092 and $6,797, respectivey.

Norton & Smith, Seattle, Wash., heating and plumbing Times Publishing Co.'s building. The building complete will cost $500,000.

Wells & Newton Co., New York, heating and ventilating new hospital at 196th Street and Grand Concourse, Bronx.

W. A. Pope & Co., Chicago, Ill., heating and plumbing plant.

Fitzpatrick & Hoepfner, Columbus, O., heating and plumbing new General Hospital in Buffalo, N. Y., for $250,000.

Gillis & Geoghegan, New York, heating store and office building at Frankfort and Nassau Streets, New York.

Hanley-Casey Co., Chicago, Ill., heating addition to the Cook County Hospital, for $39,000.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until March 14, 1916, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Antigo, Wis.

Until March 17, 1916, for the construction of the U. S. Post Office at Charles City, Ia.

Until March 21, 1916, for the installation complete of the mechanical equipment (except elevators, lifts and lighting fixtures) of the U. S. Post Office at New Haven, Conn. Drawings and specifications at Washington and at office of James Gamble Rogers, 470 Fourth Avenue, New York.

Until March 22, 1916, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Aberdeen, Wash.

Until March 23, 1916, for the mechanical equipment, except elevators, of the U. S. Custom House, appraisers' stores and court house at Wilmington, Del.

Until March 30, 1916, for the construction complete, of the U. S. Post Office at Huntington, Ind.

FOR SALE.

One Heavy Construction, Full-Housed Mine Fan, top horizontal discharge, overhung 10-ft. diameter wheel, complete with pedestal, thrust and outboard bearings, and flywheel pulley. Capacity, 70,000 cu. ft. at 350 R.P.M. As good as new and a bargain. Address Aluminum Ore Co., East St. Louis, Mo.

WANTED.

Position Wanted.—I have the brains and energy to take hold of the steam fitting end of your business or any department thereof and put it on a sound, profit-paying basis. My experience covers all details of the work, from office to job, inclusive. I can design, estimate, solicit, sell and install steam heating and power work, large or small, along progressive, solid business-building lines. Salary or percentage of profits. Address "K," care of HEATING AND VENTILATING MAGAZINE.

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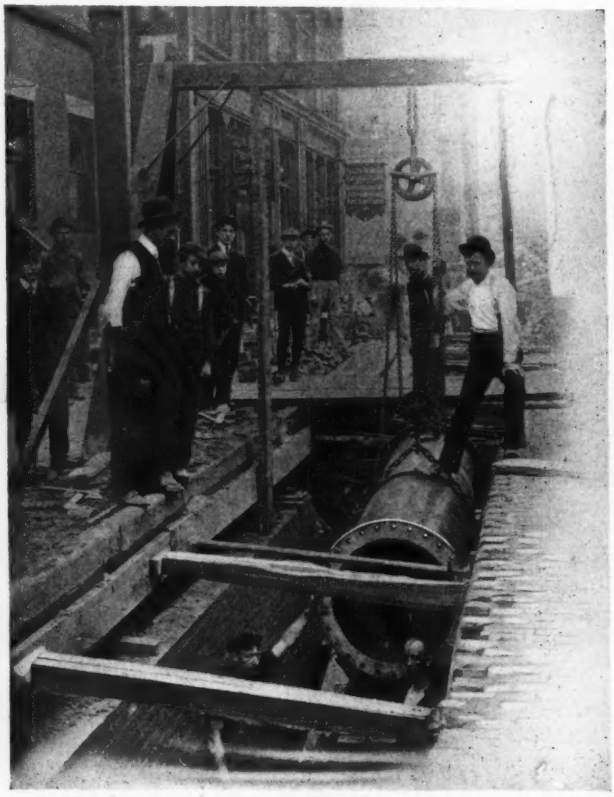
As the Method of the Future



Installing 30-Inch Steam Main in Progressive City of Middle West

The central station system of steam heating marks as great an advance over primitive methods, such as the open fire-place, coal stove, the modern hot air furnace or the individual steam and hot water heating plant, as does the latest type of steam engine over those first designed and manufactured.

Hundreds of Cities in All Parts of the Country Now Have Central Heating Service

Will yours be the next? There is no class of service as popular with the public, no patronage which can be acquired with as little effort, none which is as sure to continue permanently as steam heating.

Heat cannot be stored in summer for winter use, therefore it must be manufactured when required. It can be generated more cheaply in large quantities and in plants having properly-designed generating units, than it can be manufactured in small quantities. Finally, with modern equipment, it can be transmitted more economically than gas, water or electricity.

These Constitute the Essentials of a Profitable Business.

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Why Didn't They?

When an engineer examines one of our corrugated copper expansion joints, which takes up expansion just as an accordion would, he usually says, "Why didn't someone think of it before?" There is no answer. They just didn't.

This joint is the simple, logical way to take up expansion or allow for contraction in a steam pipe line. It does away with sliding joints which require packing and is as permanent and trouble-free as the pipe itself.

You see, the joint being made of one piece of heavy, corrugated copper, reinforced by external equalizing rings, takes up the slow, infrequent movements of the pipe due to temperature changes by almost imperceptible compression of each of the corrugations;—eliminating the liability of the joint getting out of order with the consequent necessity for packing and other attention. The steam, ever alert to escape by even the tiniest passage, can never get the better of this one-piece joint.

Now as to the sizes—it is made for any size pipe line and for any pressure. The full details are interestingly presented in our expansion joint catalogue sent free to engineers and other responsible persons.

E. B. Badger & Sons Co.

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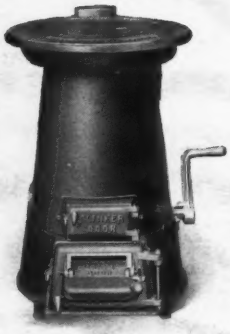
Start spring business



No. 10 Ideal Arco

The need for a hot water supply after the heating boiler, with its coil, has been shut down, will soon confront many house-owners. Why not start right now to secure additional business by looking up those for whom you installed heating plants last fall and advising them, as well as all inquirers, to put in an

No. A-12 Ideal Junior

IDEAL Hot Water Supply Boiler

The steady reliability of a hot water supply from one of these small boilers is one of the comforts which makes an owner feel that his home is just a little bit the most satisfactory home in the world.

No. 152 Ideal Premier

Their low first cost and the mere nominal expense of upkeep, as pointed out by all enterprising contractors, will appeal to the frugality of the average house-owner. IDEAL Hot Water Supply Boilers add to the comfort of living and reduce the high cost of living.

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For easy computations of sizes, ratings, etc., see special tables and other information on IDEAL Hot Water Supply Boilers in the "Ideal Fitter."

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